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Utah Lake-Jordan River Water Quality Management Planning Study

Environmental Protection Agency

**Prepared For
Nelson, Haley, Patterson and Quirk, Inc., Denver, Colorado**

Sep 76

PB 263 310

FINAL
ENVIRONMENTAL IMPACT STATEMENT
FOR
UTAH LAKE-JORDAN RIVER WATER QUALITY
MANAGEMENT PLANNING STUDY



UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION VIII **DENVER, COLORADO**

SEPTEMBER 1976

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MANAGEMENT PLANNING STUDY

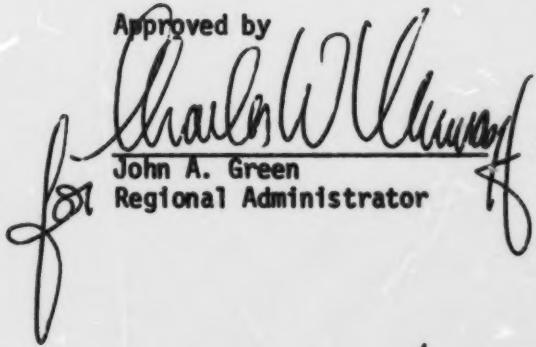
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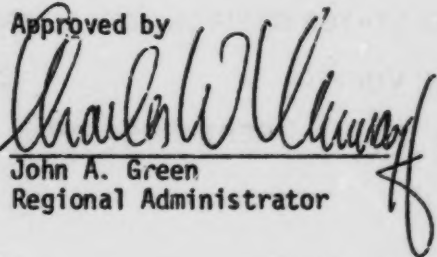
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1. Name of Action: (X) ADMINISTRATIVE () LEGISLATIVE
2. Description of Action: The Utah Lake-Jordan River Water Quality Management Planning Study consists of a series of proposed wastewater treatment alternatives to resolve water quality problems in all parts of Davis, Salt Lake, Utah, Wasatch, and Juab Counties in the State of Utah. This Plan contains a recommendation to expand wastewater treatment facilities through regionalization along with upgrading treatment efficiencies to meet Utah's Level III effluent requirements. The water quality regulations of Utah establish effluent requirements of Level III treatment prior to discharge of domestic wastewater by July, 1980. This EIS contains a regional evaluation of the water quality, economic, land resource, social, and air quality implications of the Plan. EPA expects to approve the Utah Lake-Jordan River Water Quality Management Plan and in doing so believes, as presented in this EIS, that the recommended alternatives provide significant water quality benefits and will not produce significant adverse effects which cannot be mitigated through proper consideration during the 201 facilities planning process. During the facility plan/environmental assessment review process, EPA will give special consideration to certain potential and project specific impacts as indicated in the Final EIS (see CHAPTERS XII and XIII). EPA will also in implementing the Plan attempt, with the presently limited Federal funds, to achieve first the Federal requirements of achieving secondary treatment and compliance with water quality standards by July, 1977, and to achieve second the requirement of Utah's Level III effluent discharge limitations by July, 1980.
3. Environmental Impacts: Environmental impacts are presented in terms of impacts on water quality, land resources, and air quality, as well as economic, financial, and social impacts. Water quality impacts are presented in Chapter IV, land resource impacts together with economic, financial, and social impacts are presented in Chapter V, and air quality impacts are presented in Chapter VI. Unavoidable adverse impacts are presented in Chapter VIII and mitigating measures are presented in Chapter IX.

4. Alternatives: Approximately 12 wastewater treatment alternatives were considered for several sub-areas of the Utah Lake-Jordan River Basins. These sub-areas are Davis County, Salt Lake County, Northern Utah County, Central Utah County, and Wasatch County. These alternatives are presented in Chapter III.
5. Distribution: The Distribution List presented on page v contains the names of all the agencies, groups, and individuals requested to comment on the draft environmental impact statement and who submitted written comments.
6. Draft Environmental Impact Statement sent to Council on Environmental Quality: May 21, 1976.
7. Final Environmental Impact Statement sent to Council on Environmental Quality: September 1976.

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*Responded by letter to Draft EIS.

FOREWORD

This final environmental impact statement (EIS) is the end result of a decision by the U. S. Environmental Protection Agency to issue a full scale EIS on the Utah Lake-Jordan River Water Quality Management Planning Study.

This statement is organized into 13 chapters dealing with the background, facility alternatives, environmental impacts, and public comments to the draft EIS. A summary section precedes the numbered chapters and contains the key issues documented in the final EIS. The detailed environmental impacts are presented in Chapters IV, V, and VI and are divided into water, land, and air resources for ease of presentation.

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SUMMARY

SECTION 1 - DESCRIPTION OF PROPOSED ACTIVITIES

In December, 1971, the Utah Division of Health, Environmental Health Services, undertook a major water quality management study of the Utah Lake-Jordan River Hydrologic Basins. A comprehensive plan for directing future water quality control activities within the Basins was subsequently developed in which many different alternative wastewater treatment schemes were evaluated to attain the water quality standards established by the State of Utah.

The plan was then submitted to the Environmental Protection Agency (EPA) for their review. If the plan is approved by the EPA, federal funds will be available to assist in the construction of the treatment facilities. The EPA has evaluated all of the alternatives presented in the plan in terms of their effect upon the environment. That evaluation was reported in a full Draft Environmental Impact Statement. Both the original draft statement and the summary were presented for review by Federal, State, and local agencies, as well as private groups and individuals. Comments from these reviews were considered by the EPA and are presented in Chapter XIII of the Final EIS.

SECTION 2 - BACKGROUND

Water quality management is an attempt to assure a safe and dependable supply of water for all types of uses through the implementation of various types of controls, treatments, and other practices. This area, which is of vital national concern, has received Federal, State, and local legislative recognition. In 1972, Congress enacted amendments to the Federal Water Pollution Control Act (Water Pollution Act), sections of which provide for comprehensive water quality management planning. Several distinct planning processes have been established by the Water Pollution Act; each of these has its own scope and purpose but depends upon the others for its ultimate effectiveness.

One basic planning process is a River Basin Plan prepared under Section 303 of the Water Quality Act. This process is primarily a state effort and establishes procedures to manage the water quality of a river basin, which is the area drained by a river and its tributaries. The concept of basin oriented water quality planning is an important one. The fluid nature of water is responsible for the creation of intimate physical, chemical, and biological linkages between the streams and impoundments of any watershed, especially with respect to downstream movement. Discharges to receiving waters at one location in a watershed may thus have an effect at that location as well as in downstream areas throughout the basin.

A Facilities Plan (Section 201 of the Water Pollution Act) is a planning process that focuses upon the building of particular waste treatment facilities and compares all possible courses of action. This plan serves as a basis for a community's application for a federal grant to cover the costs of building or modifying its treatment facilities. An Areawide Waste Treatment Management Plan (Section 208) deals with areas that have serious water pollution problems. Area-wide planning must consider all of the things that contribute to a comprehensive plan for managing and controlling quality.

To receive Federal funding for the construction of wastewater treatment facilities and other pollution control projects, water planning programs, such as those described above, which evaluate alternative projects and their respective environmental effects must be provided to the EPA. The Utah State Division of Health (Environmental Health Services, Bureau of Water Quality), undertook a major water quality management study of the Utah Lake-Jordan River basin area. (See Figure I-1.) The study, designed to meet the Section 303 basin plan provisions of the Water Pollution Act (See Figure II-14 for drainage characteristics), was completed in 1974 and the results and evaluations of alternative wastewater treatment plans were compiled in the Report of Utah Lake-Jordan River Hydrologic Basins Water Quality Management Planning Study (hereinafter referred to as the Plan). The Plan was published in final revised form in June, 1975. The basic purpose of the study was to develop a comprehensive plan for determining the direction of future water quality control activities within the Utah Lake-Jordan River area. The major focus of the Plan was to describe the physical facilities required to attain the water quality standards established by the State of Utah. A number of different wastewater treatment alternatives were evaluated in the Plan resulting in a set of actions recommended by the Utah State Division of Health. The final plan was submitted to the U. S. Environmental Protection Agency (EPA) in September, 1975 for their review.

SECTION 3 - AREA DESCRIPTION

The Study Area includes all or parts of Davis, Salt Lake, Utah, Wasatch, and Juab Counties, and is presently served by 30 wastewater treatment plants (See Figure II-2).

As the population of this area increases, it is necessary to increase the capacity of water treatment facilities to meet the increased water use. The total population in the Study Area in 1970 was 726,488 persons. Table 1 shows 1970 population and projected 1995 populations by planning area within the Study Area (Figure III-1 identifies the planning areas). This anticipated increase will create more of a demand for beneficial water uses than the existing treatment facilities can handle.

Approximately 2/3 of the Study Area is forest and woodland. This land is expected to remain pretty much the same; however, the land presently used for agriculture purposes will be affected by the population increase. Approximately 32,000 acres of this land will be converted to urban use to accommodate the additional people (See Figures III-2 and III-3 for existing and future land use descriptions, respectively). In 1995 approximately 60 percent of the people will be located in the North Davis area, Salt Lake City area, South Salt Lake area, and Murray-Cottonwood area. The 1970 to 1995 population increase will least affect (less than 50 percent increase) the Salt Lake City area, Lake Mountains area, Provo area, and Goshen/Nephi area while the North Davis area, Central Davis area, Murray-Cottonwood area and Tri-Community/Sandy area will be most affected (greater than 100 percent increase).

TABLE 1
EXISTING AND PROJECTED POPULATION

<u>Planning Area</u>	<u>Population</u>		<u>Percent Increase</u>
	<u>1970</u>	<u>1995</u>	
North Davis Area	58,632	127,800	118
Central Davis Area	9,518	32,500	241
South Davis Area	45,234	80,700	78
Magna Area	9,992	18,500	85
Salt Lake City	174,870	242,356	39
South Salt Lake Area	147,287	260,062	77
Murray-Cottonwood Area	74,816	172,207	130
Tri-Community/Sandy Area	51,642	116,882	126
American Fork Area	53,370	100,646	89
Heber Valley Area	5,863	9,820	68
Lake Mountains Area	295	340	15
Provo Area	59,826	86,415	44
Springville Area	12,160	21,730	79
Spanish Fork Area	9,001	14,752	64
Payson Area	8,120	12,536	54
Goshen/Nephi Area	<u>5,862</u>	<u>7,311</u>	25
TOTAL	726,488	1,304,557	80

SECTION 4 - WATER QUALITY TERMINOLOGY AND BASIC ECOLOGICAL CONCEPTS

Fundamental to the understanding of the studies performed and the evaluations of alternatives is background information regarding water quality terminology and some basic ecological principles. Certain parameters are of utmost importance in describing existing water quality and in evaluating future effects of wastewater treatment alternatives. These important parameters include Dissolved Oxygen (DO), Biochemical Oxygen Demand (BOD), coliform bacteria, nitrogen, phosphorus, and solids. Coliform bacteria are reported as number of organisms per 100 milliliter sample. All of the other parameters are reported as milligrams (1/1000 gram) per liter.

The concentration of DO can be considered one of the most significant elements in an aquatic ecosystem. The composition and productivity of the more desirable biological communities is directly related to dissolved oxygen concentration. More pollutant tolerant species predominate as DO levels decrease. As DO increases, the more desirable aquatic life forms dominate. Warm water fish can be maintained at DO levels of 4 to 5 mg/l. More cold water fish require DO in excess of 5 mg/l.

The introduction of treated discharge or effluents from wastewater treatment facilities that are operating ineffectively can result in a reduction of the dissolved oxygen in a receiving stream because bacteria and other organisms use up oxygen as they metabolize the organic and inorganic materials contained in the effluent. The biochemical oxygen demand determination is used to assess the amount of organic material in the effluent or in the receiving water body that can be utilized by bacteria. The higher the BOD, the greater the potential for pollution and subsequent oxygen depletion. The higher the level of wastewater treatment, the more BOD that will be removed from the effluent.

A variety of inorganic nutrients are also contained in wastewater effluent. A number of nutrients are required to sustain a healthy aquatic ecosystem, but in excess, these same nutrients can cause accelerated growth of certain types of organisms. This results in an unbalanced ecosystem and often leads to the proliferation of undesirable species. Nitrogen (including ammonia) and phosphorus often appear to be the limiting nutrients in aquatic systems. At high levels, these nutrients can allow algal growth to increase tremendously.

Large amounts of algae (microscopic plants) can clog water filtration systems, produce offensive odors, and impart an undesirable taste to water used for domestic purposes. Certain species of algae in high concentrations can be toxic to livestock and man. This algal proliferation is termed a "bloom." After bloom conditions occur, the algae die and become a food source for bacteria and other microscopic organisms. In this manner the algae provide organic material like that found in wastewater treatment effluent which causes oxygen in the water to be used up as mentioned before.

The coliform group of bacteria is found in human and animal waste as well as on plants and in the soil. Fecal coliforms, associated with

human and animal waste, are not considered to be disease-causing organisms; however, their presence in water in large numbers is considered to be an indicator of pollution and a public health hazard. When fecal coliform bacteria are high, the probability of the presence of disease-causing bacteria is considered also to be high.

Two types of solids are of water quality concern, Total Suspended Solids (TSS) and Total Dissolved Solids (TDS). Solids is a broad term which includes all of the organic and inorganic constituents of water. Total Suspended Solids represent the residue remaining on the filter after water is filtered. High levels of such solids impart the muddy or murky color of surface waters, may harm fish and other aquatic organisms by interfering with their breathing structures (such as gills in fish), and, depending upon the type of solids involved, can be hazardous to humans if consumed. Total Dissolved Solids, more commonly referred to as salinity or salt content, describes those chemical constituents of water which cannot be removed by filtration. Large amounts of these solids can render water unusable for irrigation and stock watering purposes. Also, high TDS can produce a laxative effect if consumed by man.

Point source pollution is, as the term implies, that pollution which can be considered as originating from a defined point. Examples include wastewater treatment plants and industrial discharges. Non-point source pollution is that pollution which is generated from large areas rather than from what can be considered a single source. Runoff from various types of land areas, such as agricultural, is the best example. Solids, nutrients, pesticides, and organic material can be washed into receiving waters from these lands in significant amounts. Non-point pollution sources and controls are one of the major concerns of the three 208 areawide wastewater treatment management programs which are being conducted in the Study Area.

SECTION 5 - HEALTH EFFECTS

Wastewater treatment plants are designed to reduce BOD, solids, nutrients, and bacteria levels on the wastewater which is received from particular service areas. When the volume of wastewater to be treated increases beyond the design capacity of the plant, the efficiency of the treatment is reduced and the percent reduction of BOD, solids, nutrients, and bacteria drops. This results in poorer water quality in the receiving water body thereby increasing the potential for degradation of aquatic systems and for increased health related problems.

A multitude of chemical and biological constituents of treated domestic wastewater effluent can produce effects on public health. As previously mentioned, water with high solids concentrations can produce a laxative effect upon man. Disease-causing bacteria and viruses, which cannot be completely removed by conventional wastewater treatment, may cause many different types of diseases including influenza, dysentery, typhoid fever, cholera, gastroenteritis, tuberculosis, anthrax, brucellosis, polio, and salmonella infections.

Disinfection by chlorination usually reduces significantly the numbers of these organisms reaching a receiving water body. Algae, although not considered to be directly disease-causing, can impart undesirable tastes, odors, and color to the water. Certain species of algae, especially blue-greens, can be toxic to wildlife, domestic livestock, and fish while large amounts of decaying algae can reduce dissolved oxygen levels to such an extent that aquatic organisms die. Decaying algae also may offer an excellent base upon which disease-causing organisms can grow.

Other components of treated wastewater effluent which can have detrimental effects on public health include pesticides, organic solvents, radionuclides, trace elements, and various other chemicals. Non-point and industrial point sources usually contribute most of these pollutants to receiving waters. The concentrations occurring in treated domestic wastewater effluent is usually very low, therefore, no imminent public health danger is usually present from these materials.

SECTION 6 - WATER QUALITY STANDARDS AND TREATMENT LEVELS

Various water quality standards have been developed by Federal and State entities which relate to the aforementioned important water quality parameters. Although standards and timetables for compliance may differ, all are designed to provide for the protection of aquatic ecosystems, continued beneficial use of the water, and public health. Stream standards are legal protective limits which define the quality of the water which is to be maintained. To insure that stream standards are met, effluent standards are placed upon discharge sources. Various levels of wastewater treatment can then be implemented to meet the effluent limitations and maintain the existing stream standards. Generally speaking, more stringent effluent limitations exist for small receiving streams since the dilution and assimilation capabilities of small streams are usually low compared to larger streams.

All waters within the Study Area have been classified as Class "C" by the Utah State Water Pollution Committee and Board of Health. A summary of the Class "C" standards is shown in Table 2 along with EPA's national ambient water quality criteria. The compliance data for attainment of these Class "C" standards as set by the State of Utah is June 30, 1983.

In addition, Utah has adopted an anti-degradation policy requiring waters whose existing quality is better than that prescribed for their assigned classification be maintained at that high quality unless it has been demonstrated to the State that a change is justifiable as a result of necessary economic or social development and that it will not preclude present and anticipated use of the waters. A further provision is that wastes discharged to upstream waters under limitations imposed by a given classification shall be further controlled as required to protect water quality designated by all downstream classifications.

Various levels of treatment have been proposed by the State of Utah to achieve the state water quality standards. These various levels

TABLE 2

UTAH LAKE-JORDAN RIVER APPLICABLE WATER QUALITY STANDARDS

<u>Parameter</u>	<u>Utah's Class "C" Standards</u>	<u>EPA's Water Quality Criteria</u>
Dissolved Oxygen	5.5 mg/l (6.0 mg/l for Class "CC")	Varies according to aquatic ecosystem requirements
Total Coliforms	5000/100 ml	None
Fecal Coliforms	2000/100 ml	200/100 ml (for pro- tection of swimmers, etc.)
Total Dissolved Solids	500 mg/l (1962 Public Health Service Drinking Water Standards)	250 mg/l (for chlo- rides and sulfates)
Suspended Solids	None	25 mg/l for excel- lent fisheries 25-80 mg/l for good to moderate fisheries 80-400 mg/l for fair to poor fisheries

of treatment which were examined in the Plan with their expectant effluent quality are shown in Table III-4. Treatment Levels I and II and both generally considered secondary treatment with Level II providing some additional ammonia removal. Treatment Levels III and IV are generally considered advanced treatment which primarily provides additional solids and BOD removal. The following is a comparison of Utah's effluent standards with those prescribed by the EPA for secondary treatment effluent.

	<u>Utah 1977</u>	<u>Utah 1980</u>	<u>EPA Secondary Effluent</u>
BOD (mg/l)	25	10	30
TSS (mg/l)	25	10	30
Total Coliforms (#/100 ml)	2000	200	-
Fecal Coliforms (#/100 ml)	200	20	200

The above fecal coliform standards have been established for protecting human health since these bacteria are considered an indicator of the presence of disease-causing organisms. The EPA standard of 200/100 ml is the same as Utah's 1977 fecal coliform standard but is ten times higher than Utah's 1980 standard. EPA is considering dropping its present standard and recognizing instead a level of disinfection which will meet applicable water quality standards. As shown in Table 2, Utah's present water quality standards for fecal coliform is 2000 organisms/100 ml. Differences in these standards are due primarily to the somewhat unknown relationship between the presence of fecal coliform and disease-causing organisms.

Utah's requirements call for stringent coliform limitations for sewage effluent and somewhat less strict requirements in the receiving water. These standards take into account the need for greater restriction of coliforms in effluents known to contain large numbers of human pathogens because the health risks associated with this type discharge are more significant than those encountered in a stream environment where the coliforms may have been introduced from cattle and other non-human sources.

SECTION 7 - WATER QUALITY MANAGEMENT

The specific effects on water quality associated with the wastewater treatment alternatives contained in the Plan were analyzed in terms of economic consequences, waste load reductions, and effects on aquatic biology. A detailed discussion of these effects is presented in Chapter IV of the Environmental Impact Statement.

The following is an analysis by county of existing water quality, the wastewater treatment alternatives, and their effect on water quality.

All costs/person/year presented in this Section in the EIS are based upon 1973 costs and do not include EPA's 75 percent funding of capital expenditures. These figures also utilize a 1975-1995 median population figure.

It should be noted that the Mountainlands, Weber River, and Salt Lake County 208 Planning Studies are concentrating their efforts on non-point source evaluation and control for the area. As is pointed out in the following, there appears to be a significant pollution contribution from non-point sources. However, the estimated non-point pollution loadings which were determined from examining the total, point, and non-point pollutant contributions to the receiving waters are not based on the information being developed by these 208 agencies. Instead, the available information on loading rates from different land use categories along with existing and projected land use plans were used to estimate existing and projected, 1995, non-point loadings.

The 208 agencies are developing, through a water quality monitoring program, much more information on the nature and significance of non-point pollution sources. These 208 agencies will be evaluating the feasibility of applying controls to various non-point sources. Measures which are economically, institutionally, and environmentally acceptable for control of non-point sources will be recommended. These measures, when instituted, will reduce pollution caused by non-point sources. The degree to which these controls will be effective in achieving water quality standards is not known now, but an estimate of their cost-effectiveness should be available from the 208 agencies in approximately a year.

DAVIS COUNTY

Existing Facilities

Municipal wastewater management in Davis County is currently accomplished through four treatment plants: North Davis, Central Davis, South Davis North, and South Davis South (Figure 3).

Existing Water Quality

Headwater streams draining the west slope of the Wasatch Mountains in Davis County are of high quality. As many of these streams flow through agricultural areas and then urban development water quality deteriorates. In the lower reaches, most streams do not meet Class C water quality standards.

Howard Slough does not meet the Class C water quality standard for Total Coliforms and Total Dissolved Solids (TDS) as well as recommended levels for nitrates (NO₃) and phosphates (PO₄). The same is true for Kays Creek which also violates the BOD standard.

BOD standards are also violated in the lower reaches of Bear Creek, Farmington Creek, Ricks Creek, Barnard Creek, Stone Creek, and Mill Creek. Of these, the water quality in Bear Creek, Farmington Creek, Stone Creek, and Mill Creek is also in violation of Total Coliform and NO₃ standards. Phosphate standards are violated in Farmington and Stone Creeks and TDS levels are excessive in Stone and Mill Creeks.

Alternative Treatment Schemes and Water Quality Effects

Future alternative wastewater management schemes in Davis County are presented in Table 3. The last two alternatives presented in Table 3 are alternative plans recommended by the Water Quality Management Planning Study. Recommended Plan "A" includes Level III treatment at all existing treatment plants and Recommended Plan "B" includes Level III treatment at the North Davis, Central Davis, and South Davis North facilities with abandonment of the South Davis South facility and conveyance of all wastewater from its present service area to the South Davis North facility.

The alternatives which consider only Level III treatment are generally more economical than those which consider Level IV treatment or both. Estimated cost data for each of the alternatives are presented in Table IV-2 of the Environmental Impact Statement. The plan recommended by the planning study is one of the most economical of alternatives at \$10.87/person/year. This plan with secondary treatment is estimated to cost \$4.21/person/year.

The Davis County wastewater treatment plant effluents ultimately end up in Farmington Bay and the Great Salt Lake. The high salt content drastically limits the aquatic life in the Great Salt Lake; however, a causeway to the northern tip of Antelope Island has created a barrier effectively separating Farmington Bay from the remainder of the Great Salt Lake. As fresh water enters the Bay the salinity of the Bay is being gradually reduced. The southern end of the Bay has now become a substantial recreation source (hunting and fishing) but also acts through its marshes as a nutrient sink in removing organics, nutrients, and TSS from the Jordan River as it flows into the Bay. The continual discharge of wastewater and extensive use of the marshes will stress the fragile ecosystem balance of the Bay in its unique and intriguing situation with respect to the rest of the Great Salt Lake. It is difficult to evaluate the effect of wastewater discharge in the Bay because of the limited information currently available on this ecosystem. This issue is currently being studied in the Weber River Water Quality Planning Council's 208 Program.

SALT LAKE COUNTY

For the purpose of this report, wastewater management in Salt Lake County was divided into two areas. Wastewater in the Magna Area is treated at the Magna facility and is discharged to Kersey Creek and thus to Great Salt Lake. Municipal wastewater in the remainder of Salt Lake County is currently treated at the Salt Lake City, Sandy, Tri-Community, Murray, Cottonwood, Granger-Hunter, Salt Lake City Suburban Sanitation District No. 1, and South Salt Lake City facilities. Effluent from the Salt Lake City Treatment Plant is discharged to the Salt Lake City Sewage Canal which flows to Great Salt Lake. Effluent from the remaining facilities is discharged along a 14 mile reach of the Jordan River between 94th and 21st Streets South.

TABLE 3
DAVIS COUNTY
WASTEWATER MANAGEMENT ALTERNATIVES

Alternatives	North Davis	Central Davis	South Davis North	South Davis South
DC-1	IV	IV	IV	IV
DC-2	III	III	III	III
DC-3	III ■	III ■	IV	IV
DC-4	III ■	III ■	III	III
DC-5	III ■	A	IV	IV
DC-6	III	A	III	III
DC-7	III ■	III ■	IV	C
DC-8	III ■	III ■	III	C
DC-9	III ■	III ■	B	B
DC-10	III ■	III ■	IV	D(IV)
DC-11	III ■	III ■	III	D(III)
DC-12	III ■	III ■	D(IV)	D(IV)
DC-13	III ■	III ■	D(III)	D(III)
Recommended Plan A	III	III	III	III
Recommended Plan B	III	III	III	C

LEGEND

Connect to: A - North Davis
B - Central Davis
C - South Davis North
D - Salt Lake City

Discharge to: ■ - Great Salt Lake

Existing Water Quality

Water quality problems in Salt Lake County are similar to those in Davis County. Streams originating in the Wasatch Mountains manifest high water quality in the headwater reaches but deteriorate in quality as they flow through rural and urban areas.

Except for the lower part of the Jordan River, all Salt Lake County streams meet or exceed the Class CC DO standard of 6.0 mg/l. All of the Jordan River in Salt Lake County and the Surplus Canal violate all Class C standards (except DO, which is violated only in the Salt Lake City Area) as well as the recommended values for NO₃ and PO₄. The same is true for the lower reaches of Big Cottonwood Creek and Butterfield Creek.

Emigration Creek also manifests water quality problems. Emigration Creek, above the confluence with Red Butte and Parleys Creek, is in violation of the BOD, Total Coliform, NO₃, and TDS standards. NO₃ and TDS levels are also excessive below the confluence. Red Butte Creek and Parleys Creek violate NO₃ levels and Parleys Creek also violates Total Coliform standards.

Little Cottonwood Creek and Midas Creek are in violation of the Total Coliform standard for Class C waters as well as the recommended values for NO₃ and PO₄. Mill Creek and City Creek manifest the identical problem and also have excessive TDS levels.

Alternative Treatment Schemes and Water Quality Effects (Salt Lake County)

Future alternative management schemes for the area are presented in Table 4. The wastewater treatment alternative recommended in the Plan involves the abandonment of all existing facilities except the Suburban Sanitation District No. 1 facility and the Salt Lake City plant. Wastewater from all abandoned facilities would be treated at the Suburban Sanitation District No. 1 plant. This alternative would cost \$8.78/person/year and is the least expensive alternative. With secondary treatment instead of Level III this alternative would cost \$4.83/person/year. Because of the long interceptors required, conveyance of all water to one central facility, such as specified in Alternative SLC-7, SLC-8, and SLC-11, is not more economical.

A large amount of the BOD, TDS, TN, and TSS waste loadings come from non-point sources. Future non-point source loadings do not vary among the alternatives because all alternatives are based on the same land use plan.

BOD and Phosphate point loadings vary among future alternatives. Level IV treatment alternatives would result in 48 percent less point source BOD loading and 15 percent less PO₄ loading than the Level III treatment alternatives.

TDS and TN are unaffected by Level III and Level IV treatment processes and TSS contributions from point sources are minimal (less than one percent of total waste loadings). Coliform bacteria loadings from point sources can be expected to decrease under all future alternatives because of the effluent limitations on coliform bacteria for all treatment levels.

TABLE 4
SALT LAKE COUNTY
WASTEWATER MANAGEMENT ALTERNATIVES

Alternatives	Sandy City	Tri-Community	Murray City	Salt Lake County-Cottonwood	Granger-Hunter	Salt Lake City SSD #1	South Salt Lake City	Salt Lake City
SLC-1	IV	IV	IV	IV	IV	IV	IV	IV
SLC-2	III	III	III	III	III	III	III	III
SLC-3	E	IV	F	IV	G	IV	G	IV
SLC-4	E	III	F	III	G	III	G	III
SLC-5	E	IV	G	G	G	IV	G	IV
SLC-6	G	G	G	G	G	IV	G	IV
SLC-7	H	H	H	H	H	H	H	IV
SLC-8	H	H	H	H	H	H	H	III
SLC-9	E	III	G	G	G	III	G	III
SLC-10	G	G	G	G	G	III	G	III
SLC-11	H	H	H	H	H	H	H	III
SLC-12	G	G	G	G	G	III	G	III
Recommended Plan	G	G	G	G	G	III	G	III

LEGEND

Connect to: E - Tri-Community
F - Cottonwood
G - Salt Lake City SSD-1
H - Salt Lake City

Discharge to: ■ - Great Salt Lake

The DO measurement in the Jordan River under all treatment alternatives violates the State's Class CC standard. Even without any point source BOD discharges this standard would be violated with the current non-point source loadings. Controls instituted on non-point sources as a result of the ongoing 208 programs could alter this situation in the future.

The existing water quality and bottom substrate conditions are poor for a healthy aquatic habitat in the Jordan River. Without control of non-point pollution sources, implementation of secondary, Level III, and Level IV treatment alternatives is not likely to improve these conditions. Conveying all wastewater to the Salt Lake City facility with discharge to Great Salt Lake via the Sewage Canal improves the water quality to some degree, but still not enough to support a cold water fishery. Reducing Phosphate waste loads will likely have no effect in the aquatic ecosystem because the Jordan River is nitrogen deficient indicating increased nitrogen loadings will be more of a problem. Because of the situation, however, future increases in Total Nitrogen waste loads may cause nuisance aquatic growth and associated adverse effects. Additionally, the unknown future status of Farmington Bay created by the diking makes it difficult to predict the effect of discharging wastewater effluent of secondary, Level III, or Level IV quality from the Salt Lake City facility via the Sewage Canal to Great Salt Lake. This issue is currently under study by the Weber River and Salt Lake County 208 programs.

Alternative Treatment Schemes and Water Quality Effects (Magna Area)

The Magna Area comprises that portion of Salt Lake County which drains directly into Great Salt Lake. One community (Magna), the single largest industrial complex in the Study Area (Kennecott Copper), a chemical plant, and several salt and mineral recovery operations are essentially all of man's development in the Magna Area. Because of this limited urban development, no detailed discussion is present in the Plan on alternative wastewater treatment schemes for the area. A recommendation is made by the Plan that Magna implement Level III treatment. An attempt was made to broaden the analysis by comparing the benefits of the recommended alternative (Level III treatment) to Level IV and to secondary treatment.

The alternative recommended by the Plan at Level III is more economical, \$24.22/person/year, than the Level IV treatment alternative, \$38.28/person/year. However, the cost of the recommended plan could be reduced to \$13.28/person/year if secondary treatment was permitted instead of Level III.

Because of the minimal development anticipated for the Magna area, future non-point loads are not expected to change significantly from existing conditions. Future point source pollutant loads for all parameters considered except Total Suspended Solids are expected to decrease markedly under any alternative treatment scheme. The fact that any alternative results in almost the identical reduction reflects the significant contribution from industry to the area's point source loading. Future industrial wastewater effluents were assumed to meet

EPA effluent requirements and because these sources comprise such a large part of total point source loadings to the area, the various levels of proposed treatment at Magna have little effect on the total point source waste load.

It seems reasonable to conclude that advanced wastewater treatment alternatives are not likely to alter future aquatic effects because of the extremely large contributions of industrial waste loads. Localized aquatic effect to Kersey Creek may be improved with advanced treatment, but because this Creek is essentially a drainage canal for surrounding tailing ponds, it is questionable if advanced treatment would significantly improve the aquatic ecosystem.

NORTHERN UTAH COUNTY

Existing Facilities

Northern Utah County is defined as the area served by the Lehi, American Fork, Pleasant Grove, and Orem treatment plants. All these facilities except Orem discharge to ditches or streams leading to Utah Lake. Orem discharges directly to Utah Lake. The Plan assumed that presently unsewered areas such as Alpine, Manila, and Lindon will be sewerred and connected to an existing system during the next twenty years (See Figure 3).

Existing Water Quality

Significant water quality problems in Northern Utah County surface streams are apparent in the Jordan River and American Fork River. The Lower American Fork River violates all Class C standards. The Jordan River manifests excessive concentrations of BOD, NO_3 , PO_4 , and TDS. The discussion of water quality problems in Utah Lake is presented in the section on Central Utah County.

Alternative Treatment Schemes and Water Quality Effects

Future alternative municipal wastewater management schemes for the area are presented in Table 5. The State of Utah recommended alternative includes the abandonment of the Lehi and Pleasant Grove facilities with wastewater conveyance to American Fork and expansion and upgrading of the American Fork and Orem facilities to Level III. Lehi, Pleasant Grove, and American Fork facilities currently comprise the basis of the Timpanogos Planning Association's effort. A new regional plant is anticipated.

The alternative recommended in the Plan is one of the least costly at \$18.02/person/year. If secondary treatment were permitted this cost would be reduced to \$9.92/person/year.

Non-point sources account for a significant portion of BOD, TSS, and TDS waste loads. Future BOD and TSS non-point source loadings do not vary significantly from existing conditions, but future TDS non-point source loadings do decrease approximately 25 percent. NO_3 and

TABLE 5
NORTHERN UTAH COUNTY
WASTEWATER MANAGEMENT ALTERNATIVES

Alternatives	Lehi	American Fork	Pleasant Grove	Orem
NUC-1	IV	IV	IV	IV
NUC-2	III	III	III	III
NUC-3	III Δ	III Δ	III Δ	III Δ
NUC-4	IV	III Δ	IV	IV
NUC-5	J(IV)	J(IV)	J(IV)	IV
NUC-6	J(III)	J(III)	I(III)	III
NUC-7	J(III) Δ	J(III) Δ	J(III) Δ	III Δ
NUC-8	K	K	K	III Δ
NUC-9	K	K	K	IV
NUC-10	L(III) Δ	L(III) Δ	L(III) Δ	L(III) Δ
NUC-11	L(IV) $\diamond$	L(IV) $\diamond$	L(IV) $\diamond$	L(IV) $\diamond$
NUC-12	L(III) $\diamond$	L(III) $\diamond$	L(III) $\diamond$	L(III) $\diamond$
Recommended Plan	M	III	M	III

LEGEND

Connect to: J - New American Fork
K - Orem
L - New Provo
M - American Fork

Discharge to: Δ - Utah Lake
 $\diamond$ - Provo Bay

PO₄ contributions from non-point sources are less than seven percent and 20 percent, respectively, of existing or any alternative future condition.

TDS is unaffected by treatment levels, thus all alternatives result in identical TDS loadings. Effluent NO₃ concentrations are not affected by going from Level III to Level IV treatment. BOD and PO₄ do vary with treatment level but utilizing Level III treatment will not decrease the BOD waste load because of population growth and increased use of the water. A significant decrease would occur, however, if Level IV is implemented. For the same reason (population growth) the PO₄ waste load is decreased only slightly if Level IV, rather than Level III, treatment is achieved. Both BOD and PO₄ waste loads would increase over the existing conditions if only secondary treatment were utilized. Coliform bacteria loadings from point sources can be expected to decrease under any alternative because of effluent limitations on such bacteria for secondary, Level III, and Level IV treatment.

The aquatic effects associated with wastewater treatment alternatives in Northern Utah County are related to Utah Lake because treatment plants and industrial sources discharge close to or directly to the Lake. Based on this and because the total BOD waste loading is only slightly reduced for Level III and Level IV alternatives, no significant increase in the DO of Utah Lake should result. For alternatives containing recommendations for regionalization, increased discharges may impose some localized DO reductions; however, the mean DO concentration in Utah Lake in the Northern Utah County area ranges well above the Utah State Standard of 5.5 mg/l for warm water fisheries. Utah Lake is currently a nitrogen-deficient system; consequently, minor reductions or increases in phosphate waste loads should have little effect on the ecosystem. However, significant increases in nitrogen loadings may cause algal blooms depending upon other limiting factors including sunlight penetration of this relatively murky water body.

CENTRAL UTAH COUNTY

Existing Facilities

Central Utah County is defined as that area served by the Provo, Springville, Spanish Fork, Payson, and Salem treatment plants. In developing wastewater management alternatives, it was assumed that unsewered areas such as Mapleton and Salem Hills will be sewered and connected to existing system during the planning period (See Figure 3).

Existing Water Quality

Significant water quality problems in Central Utah County surface streams are apparent in Beer Creek, Provo River, Hobbie Creek, and the Spanish Fork River. Beer Creek violates all Class C standards. The Provo River is high in all parameters except Total Dissolved Solids. Hobbie Creek and Spanish Fork exhibit significant levels of all constituents except BOD.

Utah Lake is the final receiving water for all surface streams in the County except the Jordan River which is the major drainage for Utah Lake. Except for high PO_4 and TDS levels, the main Lake body is within the standards established for it (Class CW). The same is not true of the principal bays and areas around the polluted tributaries. Water in Provo Bay does not mix well with the remainder of Utah Lake. As a result of this and tributary drainage, sections of Provo Bay do not meet Class CW standards. In the eastern end of Provo Bay, DO levels are slightly deficient while NO_3 and PO_4 levels are high. However, DO levels are higher in much of the remaining portion of the Bay than in the rest of Utah Lake. Also in contrast to the remainder of the Lake, all of Provo Bay exhibits low TDS concentrations. Goshen Bay has lower BOD levels than found in Provo Bay and in much of the main water body of the Lake. Because of the lack of significant tributary flow and underlying salt flats, Goshen Bay has extremely high TDS concentrations.

Alternative Treatment Schemes and Water Quality Effects

Alternative future wastewater management alternatives for Central Utah County are presented in Table 6. The State of Utah recommended alternative includes the abandonment of the Springville and Spanish Fork facilities with wastewater conveyance to Provo and the expansion and upgrading of the Provo facility to Level III. Salem is to maintain a Level II facility with a discharge to Payson for Level III treatment.

The costs and capacity associated with the ongoing program for upgrading and expanding the Provo treatment facility to Level III treatment are utilized in the economic analysis and consequently secondary treatment was not analyzed. This upgrading and expansion includes additional capacity to accommodate the alternative recommended by the Plan.

Future non-point sources comprise approximately 90 percent of the total BOD waste load in Central Utah County; therefore, any change in municipal wastewater loadings results in only a small change in the overall BOD waste load in the area. Although TSS waste loads are significantly different at different levels of treatment, non-point sources account for over 99 percent of the total waste load and, therefore, over-shadow any TSS reduction attributable to advanced treatment processes. Similarly, almost half of the total PO_4 waste load is attributable to non-point sources which greatly reduces the overall effect of advanced wastewater treatment. Thus, because of the effect of current plans to implement Level III treatment at Provo, significant non-point contributions, and industrial sources, the total future waste loads do not significantly change with any alternative. Moreover, total future waste loads either do not change significantly or increase when compared to existing conditions. This situation indicates the need for non-point source controls as being studied by the 208 Programs.

None of the alternatives reduce BOD waste loads to the extent which would improve the aquatic ecosystem of Utah Lake. Some alternatives (CUC-7, CUC-8, CUC-9, and CUC-10) will discharge to Utah Lake and will

TABLE 6
CENTRAL UTAH COUNTY
WASTEWATER MANAGEMENT ALTERNATIVES

Alternatives	Provo	Spring- ville	Spanish Fork	Salem	Payson
CUC-1	IV	IV	IV	IV	IV
CUC-2	III	III	III	III	III
CUC-3	IV	IV	IV	N	IV
CUC-4	III	III	III	N	III
CUC-5	IV	P	P	IV	IV
CUC-6	III	P	P	III	III
CUC-7	III 	P	P	III	III
CUC-8	III 	P	IV	IV	IV
CUC-9	III 	P	III	III	III
CUC-10	III 	P	P	P	P
CUC-11	IV 	P	P	P	P
CUC-12	III 	P	P	P	P
Recommended Plan	III	P	P	II 	III

LEGEND

Connect to: N - Payson
P - Provo

Discharge to:  - Utah Lake
 - Provo Bay
 - Payson Plant

increase the potential for nuisance aquatic growth. Changes in water quality due to a Lake outfall could affect spawning areas at the mouth of Provo Bay.

WASATCH COUNTY

Existing Facilities

Heber City and Midway are the only communities in Wasatch County currently operating wastewater collection and treatment facilities (See Figure 3).

Existing Water Quality

Although water quality problems are limited in Wasatch County, the use of surface waters for water supply magnify the concern for the quality of these waters. The most significant problem seems to be excessive nutrient levels in streams entering Deer Creek Reservoir, such as Spring Creek, Daniels Creek, Center Creek, Lake Creek, and Snake Creek as well as the upper Provo River and its tributaries. These inputs also serve to increase NO_3 and PO_4 levels below Deer Creek Reservoir. Decker Creek and Spring Creek also have Total Coliform amounts in excess of Class C water.

Alternative Treatment Schemes

Heber's collection system suffers massive infiltration and all future alternatives assume correction of this problem. Alternative future wastewater management systems for Wasatch County are presented in Table 7. The alternative recommended in the Plan includes Level II treatment facilities at both Heber and Midway with effluents discharged to a new regional facility at Charleston for Level III treatment.

The alternative recommended in the Plan is one of the least expensive at \$30.30/person/year. If only secondary treatment were required this cost would be reduced by 2/3 because the cost of interceptor lines and advanced treatment equipment at Charleston would be eliminated.

Non-point sources currently contribute between 56 and 98 percent of the total waste load for those parameters considered. Because future development is limited, the future non-point sources pollution is expected to be almost identical to existing conditions. In terms of total waste loadings, future BOD, TN, and PO_4 loads will be less than existing conditions. However, the impact of advanced waste treatment on these reductions can be misleading. Actually, future waste loads were estimated by assuming the massive infiltration/inflow problem in the Heber Valley would be resolved. Thus, even with more people, future waste flows will be less than existing if development occurs as predicted. It should also be noted that although future total area waste loads are less than existing loadings, the location of discharges can have a significant impact on the surface waters used for water supplies. All alternatives except WC-6 require

TABLE 7
WASATCH COUNTY
WASTEWATER MANAGEMENT ALTERNATIVES

Alternatives	Heber	Midway
WC-1	IV	IV
WC-2	III ●	III
WC-3	Q	III ●
WC-4	R	II ☐
WC-5	R	IV ●
WC-6	P	P
Recommended Plan	II ★	II ★

LEGEND

Connect to: P - Provo
Q - New Charleston
R - New South of Heber

Discharge to: ☐ - Percolation
★ - Effluent to New Charleston (III)
● - Provo River

discharges in or above Deer Creek Reservoir. Because the Reservoir is a source of raw water for Salt Lake City and a potential source for Orem and Provo, these alternatives may have a detrimental effect on that use.

The aquatic effects of the alternative wastewater treatment schemes are extremely difficult to assess for Wasatch County because of the almost total lack of water quality data in this area. From what little information is available, it can be concluded that discharge of Heber effluent to the Provo River may enhance the aquatic habitat of Spring Creek, but at the expense of the Provo River. Additionally, the closer the discharge of wastewaters to Deer Creek Reservoir, the higher the potential for nutrient enrichment of the Reservoir.

Alternative WC-4 contains a recommendation for secondary treatment and land disposal. The groundwater table in Wasatch County is extremely high and waste loads imposed on the land for assimilation may adversely affect the quality of the groundwater.

SECTION 8 - EFFECTS ON THE TERRESTRIAL ECOSYSTEM

Expansion of existing treatment facilities would affect a small area surrounding each facility. Most effects would be short-term and would persist only through the construction phase. Generation of sediment loads, noise, and particulate matter are typical construction related problems. In most cases, the area surrounding the plant has already made adjustments to those stresses and the effects of minor plant modifications would be minimal.

Consolidation of facilities with associated interceptor construction and expansion of a few regional treatment plants would also affect the terrestrial ecosystems. The size of the area to be consolidated, the length of the required connecting interceptors, and the type of habitat to be crossed all influence the severity of this effect. Interceptor corridors could cause the loss of natural intolerant vegetation communities and the introduction of more tolerant weedy vegetation, while regional facilities would require more land for expansion although the total land required would probably be less than that needed to upgrade and expand all existing facilities.

If new regional facilities are proposed, the problems discussed above would still exist in addition to removing natural habitat.

Growth-related problems (indirect effects) generally occur in the absence of land use controls to minimize such problems. Without such controls, additional treatment plant capacity and major interceptors may induce scattered or sprawl development, thereby disrupting terrestrial ecosystem habitat.

A majority of the land between urban centers is within the grass-sagebrush ecosystem but is being utilized for agriculture and has created large acreages of unique habitat types. Grain fields provide food and cover for particular upland game species and small mammals. Orchards provide food, cover, and nesting areas for several forms of "aesthetic" wildlife (i.e., song birds, game birds, etc.). While urban development of agricultural lands will not necessarily result in

elimination or disruption of particularly unique vegetation associations, the elimination of tilled acreage and a commitment of it to urban development will place increased stress on the wildlife that is dependent upon the man-created habitat.

Increased growth could also cause disruption of historical or archaeological sites. Land use management plans could be used to assist in the preservation of known sites.

SECTION 9 - LAND USE

Implementation of any of the wastewater treatment alternatives will have an effect on land use patterns. These effects can be classified as direct or indirect. Direct effects are assessed in terms of the effect that expanding existing facilities will have on present and future land uses in the immediate surrounding area. Indirect effects are evaluated by determining the influence an alternative would have on existing land use policies. An example of a direct effect might be the destruction of a wetland from construction of an interceptor, whereas the destruction of a wetland from induced growth caused by construction of an interceptor is an indirect effect. Land use consequences are discussed further in Chapter V of the Environmental Impact Statement.

DAVIS COUNTY

Alternatives DC-5 through DC-9 (Table 3) and the alternative recommended by the Plan have the greatest potential effects on land use, particularly indirect effects. All of these alternatives require interceptors across agricultural land. This could encourage urban development of the areas. All other alternatives appear to have only minor potential for effecting adjacent land or influencing land use patterns.

SALT LAKE COUNTY

Most of Salt Lake County is developed land, either agricultural or urban. Residential areas exist within 1/2 mile of the treatment facilities at Cottonwood, Tri-Community, Sandy, Granger-Hunter, and Murray. Expansion of these facilities would have an adverse direct effect on the adjacent areas as the physical facilities will require more land area. Alternatives SLC-7, SLC-8, and SLC-11 recommend abandoning these facilities and treating the water at the Salt Lake City plant. The interceptors transporting this water would cross urban areas and would have little effect on adjacent land use. The Salt Lake City plant is the furthest removed from residential areas (3/4 mile).

Alternatives SLC-6, SLC-10, and SLC-12 also involve the consolidation of treatment facilities. Under these plans, the Salt Lake Suburban No. 1 plant would be used for wastewater treatment and other facilities would be abandoned. There is some residential area 1/2 mile from the

plant, as well as some industrial development 1 mile from the plant which could be directly affected by plant expansion. In addition, uranium tailings presently located at the treatment facility could cause problems in that there is a possibility that harmful radioactive particles could be conveyed to the groundwater, Jordan River, or wastewater effluent. If the facility is made a regional treatment plant (as in the alternative above), additional land would have to be purchased unless the uranium tailings are moved. The Energy Research and Development Administration is presently funding a study to determine the effects associated with the tailings, and if needed, the best method of removing and disposing of them.

NORTHERN UTAH COUNTY

The Utah County Comprehensive Plan endorses the maintenance of agricultural land and green belts between existing communities. Without proper enforcement of land use controls, many of the wastewater treatment alternatives could potentially undermine these goals.

Alternatives NUC-5 through NUC-12 all propose the construction of interceptor lines across land which is currently agricultural. The alternative recommended by the Plan proposes continued use of the Orem facility and abandonment of the Lehi and Pleasant Grove plants. Wastewater from these abandoned plants would be transported by interceptors across agricultural land to the American Fork plant for treatment.

Alternatives NUC-1 through NUC-4 propose no new facilities or interceptors and would require only the upgrading of existing facilities. These alternatives best serve the local land use plans in that they would have a minimal effect on the surrounding agricultural land. Alternatives NUC-8 and NUC-9 have the least effect on adjacent land use as many of the plants would be abandoned thereby concentrating potential effect in a minimum number of locations.

CENTRAL UTAH COUNTY

Alternatives CUC-3 through CUC-12 and the alternative recommended by the Plan all propose interceptors through areas that are currently agricultural. Alternatives CUC-1 and CUC-2 do not require interceptors and consequently best serve the local land use policy in the area.

Alternatives CUC-10 through CUC-12 would consolidate all treatment at the Provo plant and have the least effect on adjacent land use as many of the plants would be abandoned thereby concentrating potential effects in a minimum number of locations.

WASATCH COUNTY

The two existing treatment facilities (at Heber City and Midway) have residential development within 1/2 mile of the plant site.

Alternatives WC-1 and WC-2 propose expansion and upgrading of these facilities which would directly affect adjacent land use. Alternatives WC-3, WC-4, and WC-5 consider a new regional facility at Heber Valley. Varying discharge schemes and treatment levels distinguish these alternatives (See Table 7). Alternative WC-6 suggests abandoning both facilities and connecting to the Provo facilities. The long interceptor line required by this plan would pass through Provo Canyon which is presently sparsely developed. This would effect local land use in this area over the long term. Residential and, to a lesser extent, commercial development would be facilitated. While this alternative would mitigate adjacent land use problems at Heber and Midway facilities, it would cause urbanization and commercialization of one of the most unique and naturally pristine areas remaining in the region.

The alternative recommended by the Plan would provide Level II treatment at Heber City and Midway. Effluents from both plants would be conveyed to a new plant at Charleston for Level III treatment. New plant construction would naturally affect adjacent land use.

FLOOD HAZARDS

Two facilities within the Study Area, Tri-Community and Murray, are in defined flood plains. Expansion and continued use of these facilities may create a problem during floods. Pollution from bypassing raw or improperly treated sewage could occur. As equipment damage or plant shut downs could also occur during floods, use and expansion of these facilities might require additional costs for flood protection.

The Tri-Community facility, which would be a regional wastewater treatment plant if Alternative SLC-3, SLC-4, or SLC-5 is implemented, has some protection from a clay dike but this is insufficient for a major flood. The Murray facility would be maintained in Alternatives SLC-1 and SLC-2. The worst flood occurring over a typical 250 year period would cause damage to the plant. The worst flood over a typical 100 year period would cause damage only if debris at the 4500 Street South bridge causes an obstruction to flood flow. However, both of these facilities would be abandoned under the Salt Lake County alternative recommended by the Plan.

Expansion of the Salt Lake City Suburban Sanitation District No. 1 facility to the north would require flood proofing to avoid flood hazards.

SECTION 10 - AIR QUALITY

Based on topographical and meteorological features as well as the locations of emission sources, the Study Area can be divided into two reasonably distinct air basins, the Salt Lake City basin, and the Provo basin with the Traverse Mountain (Salt Lake County-Utah County line) as the common boundary.

A variety of air pollutants were investigated to determine present air quality and to predict, by use of a detailed model, future air quality (see Chapter VI of the EIS for detailed information). Two pollutants which are closely related to urban activity and growth, and which have recognized health effects are carbon monoxide (CO) and total suspended particulates (TSP). CO is a poisonous inhalant that is dangerous because it interferes with the normal transport of oxygen throughout the human body. Large amounts of TSP are also a health hazard to humans and wildlife. They not only cause respiratory problems, but increase respiratory problems associated with sulfur dioxide pollution from other sources. High TSP reduces visibility and corrodes many materials. The EPA developed primary and secondary standards for CO and TSP are presented in Table 8.

Sources of CO and TSP can usually be classified as point, line, or area sources. Point sources are large single stack emitters such as power plants and steel mills. Major roads are line sources because of the emissions from individual vehicles travelling along the roads. Area sources are the total of many emitters not placed in the point or line classifications. Area sources include residential area space heating and traffic on minor roads.

Present Air Quality

Historically several communities in the Study Area have experienced particulate concentrations at or above the level which can cause adverse health effects. There are an estimated 10,000 line sources in the area which account for 26 percent of the TSP emissions from exhaust, tire wear, dust from unpaved roads, and highway construction. Point sources contribute 48 percent of the TSP in the area with industrial developments being the primary polluters. Area sources, mostly residential development, contribute 26 percent of the TSP in the area.

Annual average data from a Salt Lake City monitor indicates that TSP levels in the City are generally in excess of the annual primary standard of 75 micrograms per cubic meter. Data from the Kearns and Magna area indicate that the annual standard is not being exceeded there. Salt Lake City, Salt Lake City Airport, and Magna all exhibit TSP concentrations above the 24-hour maximum average standard of 260 micrograms per cubic meter.

Due to the relatively short record (1972-1974), insufficient information exists to establish trends in TSP levels in the Provo Basin. While annual average concentrations are below the primary standard at all stations except the City of Provo, 24-hour maximum concentrations above the primary standard have been recorded at all sites.

The data for CO levels in the Salt Lake City Basin is sparse. Available information shows that the 8-hour standard has been continuously exceeded while the 1-hour concentration has been generally at or just below the 1-hour standard. Transportation line sources contribute 92 percent of the CO emissions in this air basin.

TABLE 8
EPA AIR QUALITY STANDARDS FOR CO AND TSP

<u>Pollutant</u>	<u>Time (hrs)</u>	<u>Primary Standard</u>		<u>Secondary Standard</u>	
		<u>ug/m³</u>	<u>ppm</u>	<u>ug/m³</u>	<u>ppm</u>
CO	1*	40,000	35	40,000	35
	8*	10,000	9	10,000	9
TSP	24*	260	--	150	--
	1 year	75	--	60	--

* Values not to be exceeded more than once per year.

Existing data shows that CO concentrations in the Provo Basin are increasing and that 8-hour standards are exceeded and 1-hour standards are generally not exceeded. Point sources account for 15 percent of the CO concentrations in this basin while 80 percent is contributed by automotive sources and only 5 percent is produced by area sources.

The Utah State Implementation Plan (SIP) stipulates a variety of strategies (control of auto emissions, reductions in driving, improved traffic control, and increased use of public transportation) to achieve reductions in concentrations of CO. This control strategy calls for significant reduction in CO levels in both the Salt Lake City area and Provo area.

Effects

Construction or expansion of wastewater treatment facilities and interceptor lines can affect air quality directly through increases in dust and engine emissions during construction. Although these direct effects are usually of a limited nature and of short duration, they nevertheless require that specific guidelines be followed to minimize the degree of air quality degradation.

The major air quality effects related to wastewater treatment facility development are usually indirect ones. Expansion or creation of wastewater treatment facilities can encourage and accommodate residential, commercial, and industrial development. This increases motor traffic, point source emissions, and potential for urban sprawl, and dust problems related to land disturbance.

A prediction of future pollutant levels is made by assessing the effects of the land use plan associated with wastewater treatment alternatives. More detailed discussions are given in the EIS, Chapter VI.

SALT LAKE CITY BASIN

Concentrations of CO are predicted to improve markedly by 1995 because of assumed auto emission controls. As one moves toward 1995, there may still be violations of CO standards until all emission controls are implemented. Estimates of 1985 CO concentrations indicate some violation of the 8-hour CO standard in western Salt Lake City under "worst case" conditions (explained in the EIS), however, by 1995 the CO concentrations are projected to be well below the standards.

Concentrations of TSP in the basin, under "worst case" conditions, now violate both 24-hour average and annual average standards in western Salt Lake City. This condition is expected to continue with some outward movement of highest TSP concentrations toward the suburbs. Continued control of significant point sources of particulates will reduce the predicted concentrations.

PROVO BASIN

It is estimated that CO levels will meet primary standards by 1985 and will be considerably below national ambient standards by 1995, primarily the result of auto emission controls. The highest existing CO concentrations occur over southern Provo where the 8-hour standard is currently being violated. The 8-hour standard is not presently being exceeded in the area over Geneva Steel. Both of these areas will be reduced below current levels and will be within the standard by 1995.

At present, TSP primary standards are exceeded in the basin. The concentrations are expected to decrease only slightly but would then fall below the annual primary standard by 1995. However, the 24-hour TSP standard may still be violated in 1995. The TSP level will still violate the secondary standard over northwestern Provo in 1995.

SECTION 11 - ECONOMIC CONSIDERATIONS

The economic effect of any project is naturally of interest to everyone. If the wastewater treatment project that was recommended is put into operation, it will account for \$78 million in capital investments over a 20 year period. Of this amount, \$31 million will be paid in salaries to people working on the project over the same time period. New jobs that will be created by the project will number about 100 for construction and about 200 for related services. These numbers of new job openings will not significantly change the overall job outlook for construction and related services in the Study Area. The alternatives recommended under the Plan are neither the most expensive nor the least expensive. The money figures for all of the different alternatives are detailed in the complete Environmental Impact Statement.

With the conversion of land from agricultural use to urban use over the next 20 years there will be a decrease in the total amount of agricultural goods produced in the area. The amount of this loss will increase each year as more and more land is taken out of agricultural production until such loss reaches its largest figure in 1995 which is estimated to be \$6.5 million. This loss could be offset by other markets that will result from the urban use of this land.

Except for Central Utah and Davis Counties, all of the counties in the Study Area were estimated to have enough bonding capacity in 1973 to finance the Plan's recommended alternative without Federal funds. With 75 percent of the construction cost paid by EPA, all of the counties have sufficient bonding capacity to finance the project even without allowing for the likely increase in bonding capacity that has occurred since 1973 and will occur as population in the area increases. However, individual cities may experience more or less of a financial impact than indicated for each county as a whole when constructing a treatment plant because of local funding situations.

SECTION 12 - WATER RIGHT CONSIDERATIONS

A significant problem associated with the implementation of any regional wastewater treatment alternative in the Study Area is the impact on existing water rights. Existing water law in the Study Area can be summed up in the following:

- Utah water law is founded on the Colorado Doctrine of prior appropriation; i.e., "First in time - first in right."
- Water law in Utah is an adjudicatory process rather than a statutory process. Thus, the fundamentals of prior appropriation are derived from legal actions, not from legislative actions.
- Water rights in the Study Area are highly complex and not clearly definable.

Given these fundamentals, it is difficult to assess the nature of water rights problems which could develop from implementation of any wastewater treatment alternative. This can be accomplished only through judicial processes. In general, the alternative configurations which could create water rights issues involve a downstream appropriator's right being adversely affected by consolidation of facilities, land application of effluent, or changes in point or discharge upstream. If such an impact does occur, the appropriate authority may choose to enter into litigation to carry on with the proposed project or to purchase or substitute the appropriator's water right.

SECTION 13 - MITIGATION OF IMPACTS

Mitigating measures are those actions which can be taken in conjunction with implementation of any wastewater treatment alternatives or as a separate action to reduce or compensate for adverse environmental impacts associated with plan implementation. A summary of possible mitigation measures, associated with the most important environmental impacts, is given below.

The large contribution of non-point sources to specific water quality problems and the high cost of constructing advanced wastewater treatment plants makes the selection of the most appropriate mix of point and non-point source controls a very significant water quality consideration. Currently the 208 Areawide Waste Treatment Management Planning Agencies, which cover the Study Area, are developing plans to assess the extent of non-point pollution sources and will recommend measures for their control. Their plans will be based on a non-point source monitoring and evaluation program which will identify and quantify the character of non-point pollution contributing to water quality problems in the Utah Lake and Jordan River Basins. These 208 plans will recommend measures which are economically, institutionally, and environmentally acceptable for the control of non-point pollution sources.

The Plan represents a commitment of wastewater treatment facilities which will accommodate nearly a doubling of the area's population by the year 1995. This increase in population and the associated development may present additional problems to EPA's and Utah's goals for attainment and maintenance of air quality standards along the Wasatch Front. As exhibited in this environmental statement, the attainment and maintenance of carbon monoxide standards will not be a problem in the long run; however, CO standards may continue to be exceeded over the next few years and possibly through 1985 in Salt Lake City. Without further controls placed upon significant point sources of particulates, violation of

ambient particulate standards will continue. Even with greater control of point sources, increased growth and development, along with fugitive sources of particulates, could prevent the attainment and/or maintenance of the primary particulate standards.

In order to improve air quality conditions along the Wasatch Front, EPA will continue to work with the State of Utah and local governments to support and enforce the provisions called for in the State Implementation Plan (SIP). Measures called for by Utah's SIP (inspection/maintenance and retrofit) which were not accounted for in the CO predictions contained in this environmental statement should provide for earlier attainment of CO standards than predicted. Attainment and maintenance of particulate standards will require continued control, and in some cases, further reductions in point sources of particulates than presently required by Utah's SIP. Control of other sources of particulates, not now considered in the SIP, may also be required.

The future location of wastewater treatment plants and the location of interceptor sewer lines along with their design capacity will provide further opportunities for suburban development. This development will largely be at the expense of presently agricultural and vacant lands. Sensitive environmental areas such as flood plains, marshland, wildlife habitat, steep slopes, and unstable soils may also be adversely affected. Without the necessary regulation by local and county jurisdictions, such development may not be consistent with the land use goals of County and City Master Plans in the area.

EPA believes that the primary responsibility for regulating land use and development patterns is that of local governmental jurisdictions. If the potential adverse impacts associated with urban sprawl, conversion of agricultural uses to other uses, and the degradation of unique, environmentally sensitive land areas are to be controlled, it will by necessity, be these local governments that do so. Land use management including zoning, tax incentives, sewer use ordinances, tap fees, etc., represent some of the possible measures which can be taken by local governments to minimize undesirable development patterns resulting from plan implementation.

At this time, EPA has no information to suggest that implementation of the Plan will result in adverse impacts to archaeological or historical sites, or to threatened or endangered wildlife species. If such information is obtained, the appropriate coordination and action will be taken. See Chapter IX of the EIS for a more extensive list of potential mitigation measures.

SECTION 14 - ALTERNATIVE COURSES OF ACTION

The Utah Lake-Jordan River Water Quality Management Plan recommends expansion of wastewater treatment facilities through regionalization along with upgrading treatment efficiencies to meet Utah's Level III effluent requirements. The water quality regulations of Utah establish effluent requirements of Level III treatment prior to discharge of domestic wastewater by July, 1980. These 1980 effluent requirements provide for a high

degree of removal of BOD, suspended solids, and coliform bacteria. (See Table on page S-8). The State of Utah considers these effluent requirements necessary to reduce, to an acceptable level, the health hazard associated with wastewater effluents as well as to achieve in-stream water quality standards. As permitted under Section 510 of the Federal Water Pollution Control Act, the State of Utah has established these Level III effluent requirements which are more stringent than those called for under the timetables in the Federal Act.

EPA's secondary treatment effluent limitations, shown on page S-8, are presently required to be met by all domestic wastewater discharges by July 1977. Where necessary to attain water quality standards or where shown to be cost-effective, EPA supports the use of more advanced treatment levels resulting in a higher quality effluent.

The relationship between point and non-point pollution sources in determining in-stream water quality may create situations where advanced treatment levels such as Utah's Level III requirements are not needed immediately. Within the Study Area both point and non-point pollution sources cause violations of Utah's in-stream water quality standards. The Plan recommends controls for domestic wastewater point sources by specifying Level III effluent requirements throughout the Study Area. However, without the addition of non-point source controls, it is probable that in-stream water quality standards will not be achieved in some instances.

The three 208 Areawide Waste Treatment Management Planning Agencies which cover the Utah Lake and Jordan River Study Area will be recommending methods for control of non-point pollution sources. In areas where non-point pollution is the significant source, an evaluation of the degree of non-point vs. point controls can best be made by these ongoing 208 programs. In determining funding priorities over the next few years, it is necessary to analyze the costs and water quality benefits of various treatment levels and non-point source controls to determine the most cost-effective approach to meeting in-stream water quality standards in that area.

While EPA recognizes Utah's requirement of Level III treatment by July, 1980, Federal funds to aid in the construction of wastewater treatment facilities to meet this deadline are limited. Presently, EPA does not have sufficient funds to provide 75 percent Federal funding of the estimated capital construction costs for providing Level III treatment for all proposed wastewater treatment facilities in the Utah Lake and Jordan River Basins. It is therefore necessary to determine the best possible way in which to utilize these limited Federal funds over the next few years to protect public health and to attain in-stream water quality standards.

At the completion of Final EIS review period, EPA expects to approve the Utah Lake-Jordan River Water Quality Management Plan. In supporting this action EPA believes that the recommended alternatives provide significant water quality benefits and will not produce significant adverse effects which cannot be mitigated through proper consideration

during the 201 facilities planning process. During the facility plan-environmental assessment review process, EPA will give special consideration to certain potential site and project specific impacts which were identified in comments on the Draft EIS (See Chapter XIII). These potentially adverse impact categories include:

- . historic and archaeological sites
- . control of vector-borne diseases
- . energy requirements
- . flood hazards
- . engineering cost estimates
- . agricultural land use impacts
- . erosion control
- . recreational resources
- . earthquake hazards
- . sludge management
- . water rights

Where significant adverse effects within these or other impact categories may be expected for a particular facility, EPA will write an Environmental Impact Statement covering that individual project. EPA recognizes that changes may be made in the recommended alternatives during either the 201 Facilities Planning or 208 Areawide Wastewater Management Planning efforts. Such change will be considered and evaluated by EPA to determine their significance for creating adverse as well as beneficial impacts.

In approving the Plan, EPA expects implementation to occur in accordance with the following general priorities. First funding priority will be given to upgrading treatment plants to secondary treatment or to advanced levels of treatment (Level III, etc.) where necessary to attain in-stream water quality standards or where advanced treatment is found to be the most cost-effective wastewater treatment alternative. Second funding priority will be given to providing advanced treatment where an improvement in water quality is demonstrated in conjunction with control of non-point pollution sources. Third priority for funding advanced treatment will be given to those situations which do not fit the first two priority classes. This approach will spread the limited Federal funds among more projects on a priority basis, by first providing funds for Level III treatment only where such treatment is needed to attain in-stream water quality standards or where Level III treatment is shown to be the most cost-effective alternative. This approach might require some municipalities and sanitation districts to upgrade treatment plants to secondary treatment now, and in a few years upgrade to Level III.

GLOSSARY OF ABBREVIATIONS

BOD	- Biochemical Oxygen Demand
CO	- Carbon Monoxide
mg/l	- milligrams per liter
MPN/100 ml	- Most probable number of organisms per 100 milliliters
NO ₃	- Nitrates
ppm	- parts per million
PO ₄	- Phosphates
SIP	- Utah State Implementation Plan for attainment of national ambient air quality standards
TDS	- Total Dissolved Solids
TN	- Total Nitrogen
TSP	- Total Suspended Particulates
TSS	- Total Suspended Solids
ug/m ³	- micrograms per cubic meter

GLOSSARY OF TERMS

ALGAE are plants which grow in sunlit waters. They are a food for fish and small aquatic animals, and like all plants, put oxygen in the water.

BACTERIA are small living organisms which often consume the organic constituents of sewage.

BOD, or biochemical oxygen demand, is the dissolved oxygen required by organisms for the aerobic decomposition of organic matter present in water. It is used as a measure in determining the efficiency of a sewage treatment plant.

CHLORINATOR is a device for adding chlorine gas to sewage to kill infectious germs.

EFFLUENT is the liquid that comes out of a treatment plant after completion of the treatment process.

INTERCEPTOR sewers in a combined system control the flow of the sewage to the treatment plant. In a storm, they allow some of the sewage to flow directly into a receiving stream. This protects the treatment plant from being overloaded in case of a sudden surge of water into the sewers. Interceptors are also used in separate sanitation systems to collect the flows from main and trunk sewers and carry them to the points of treatment.

ORGANIC MATTER is the carbonaceous waste contained in plant or animal matter and originating from domestic or industrial sources.

OXIDATION is the addition of oxygen which breaks down organic wastes or chemicals in sewage by bacterial and chemical means.

PRIMARY TREATMENT removes the material that floats or will settle in sewage. It is accomplished by using screens to catch the floating objects and tanks for the heavy matter to settle in.

POLLUTION results when animal, vegetable, mineral, or heat wastes or discharges reach water, making it less desirable for domestic, recreation, industry, or wildlife uses.

RECEIVING WATERS are rivers, lakes, oceans, or other water courses that receive treated or untreated waste waters.

SECONDARY TREATMENT is the second step in most waste treatment systems in which bacteria consume the organic parts of the wastes. It is accomplished by bringing the sewage and bacteria together in trickling filters or in the activated sludge process.

SUSPENDED SOLIDS are the small particles of solid pollutants which are present in sewage and which resist separation from the water by conventional means.

WASTE TREATMENT PLANT is a series of tanks, screens, filters, and other processes by which pollutants are removed from water.

CHAPTER I

INTRODUCTION

UTAH LAKE-JORDAN RIVER WATER QUALITY MANAGEMENT PLANNING STUDY

Historically, management of the natural environment was the charge of segregated agencies and institutions whose responsibilities were typically isolated to a particular area of concern. However, as natural resources have dwindled, a greater emphasis on management of resources has occurred. Water quality management has come to the forefront as a critical resource management issue. In 1965, Congress enacted amendments to the Federal Water Pollution Control Act. Section 3(c) of the Act provided for comprehensive water quality management planning. Further amendments in 1972 (PL 92-500) required the development of basin plans (Section 303(e)).

In December 1971, the Utah Division of Health, Environmental Health Services Branch undertook a major water quality management study for the Utah Lake-Jordan River Hydrologic Basins, illustrated in Figure I-1. The resulting plan was completed and submitted to the U. S. Environmental Protection Agency (EPA) in September 1974.

The basic purpose of the Utah Lake-Jordan River Water Quality Management Planning Study was to develop a comprehensive plan for determining the direction of future water quality control activities within the Basins.

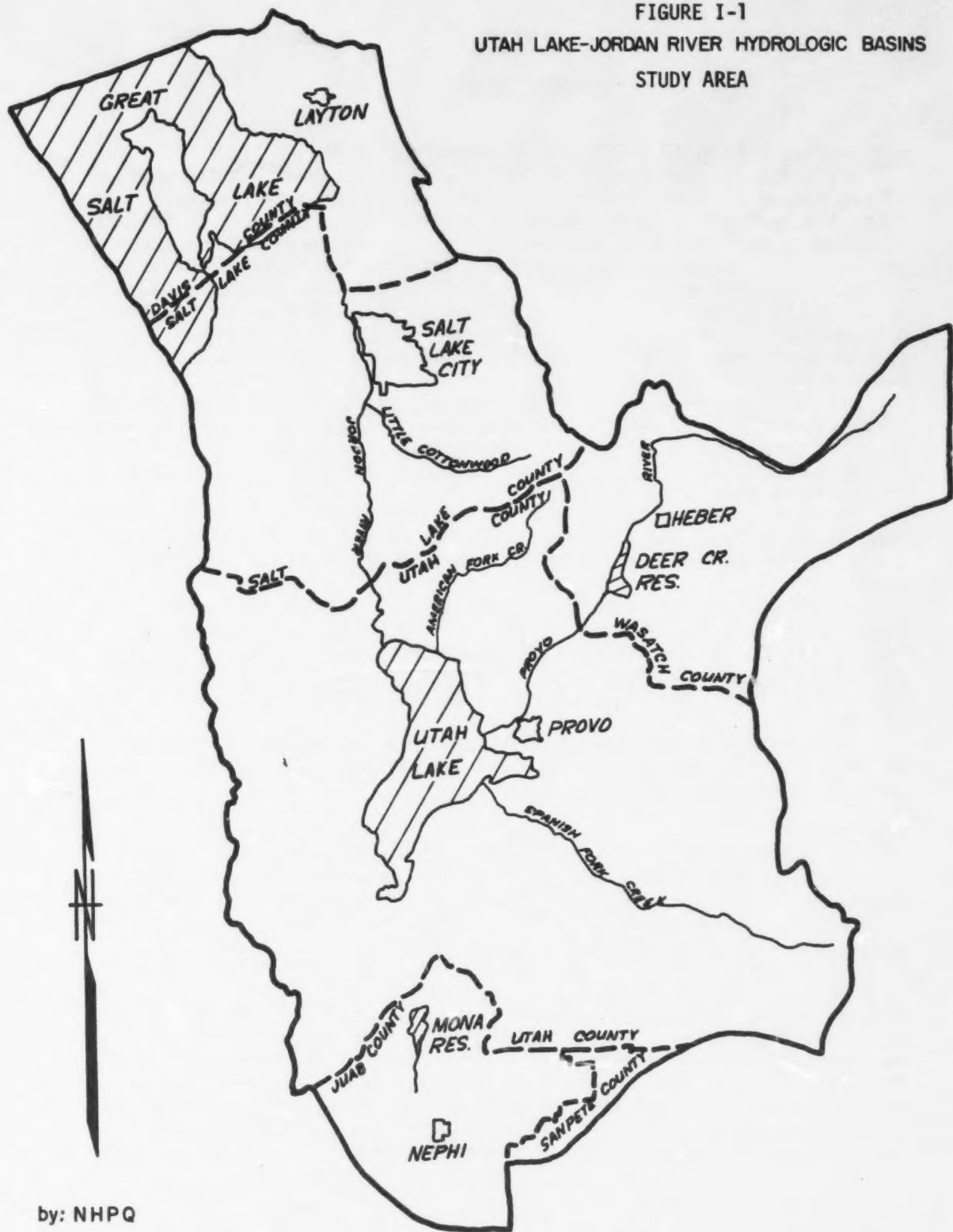
The Plan complies with Federal regulations for basin plans as defined in Section 303(e) of PL 92-500; a prerequisite to the award of Federal grants for construction of wastewater treatment facilities. Additionally the Plan identifies and describes the physical facilities required to attain the water quality standards established by the State of Utah.

As required by the National Environmental Policy Act of 1969, EPA reviewed the Plan and decided to issue the environmental impact statement (EIS) presented herein.

EIS CONTEXT

It should be clear from the socio-economic/water quality inter-relationships illustrated in Figure I-2 that there is a strong inter-dependence between use of water, land, and air resources. As illustrated in the Figure, population has a direct influence on the demand of goods and services which stimulates industrial and commercial development. This stimulation creates an employment demand and a general increase in land development through the need for schools, roads, houses, etc. Population and development generate wastewater which influences the environmental pressures created by the difference between the actual environmental setting and the population's desired environmental setting. This environmental pressure is decreased through environmental management which may influence the character of land development. Stress is constantly generated between land development and environmental management because of the difference between the available tax revenue associated

FIGURE I-1
UTAH LAKE-JORDAN RIVER HYDROLOGIC BASINS
STUDY AREA



by: NHPQ

with development and the required revenue related to the demand for goods and services. This difference generates a pressure for increased development, and thus, additional environmental pressure.

Within this context, the interrelationships among land, air, and water resources must be considered in assessing the environmental impact of the Utah Lake-Jordan River Water Quality Management Plan (Plan).

PUBLIC PARTICIPATION

The effective conduct of the EIS for the Utah Lake-Jordan River Water Quality Management Planning Study depended upon the participation and input from the various key interests in the Study Area. A key interest is perceived to be any agency, institution, organization, or other representative who may be effected by implementation of the Plan. The concept of an Advisory Committee was formulated to provide a forum for this input and participation.

A number of key interests were identified through discussion with EPA and a review of the Plan. These groups and individuals were contacted and informed of the EIS and the Advisory Committee concept. During the course of these discussions, other key interests were identified and subsequently contacted. After review of the various identified interests by EPA and the State of Utah, a Committee membership of 14 individuals was developed. Advisory Committee members are listed in Table I-1.

The first Advisory Committee meeting was held on September 4, 1975. Discussion at this meeting focused on the relationship between the EIS and the ongoing 208 planning efforts. Several Committee members expressed concern that the EIS would interfere with the 208 studies and impede the construction of needed wastewater treatment facilities.

Because of these concerns, a meeting was held on September 19, 1975, with the project directors of the Mountainlands 208 Planning Study, the Weber River 208 Planning Study, and the Salt Lake County 208 Planning Study. Representatives of the Utah Division of Health were also present. The project directors and the Division of Health representatives expressed their concern for the incompatibility of the EIS and 208 Programs. A second meeting was held with this same group on October 6, 1975. A presentation of the techniques being used to assess the impacts on air, land, and water resources was made at this meeting.

A second Advisory Committee meeting was held on October 6, 1975. The purpose of this meeting was to discuss the assessment of environmental impacts. There was also some discussion of the interrelationships between the EIS and the 208 Programs.

The Draft Environmental Impact Statement for the Utah Lake-Jordan River Water Quality Management Planning Study (DEIS) was distributed to all interested government agencies, public groups, and individuals on 14 May 1976 by the U. S. Environmental Protection Agency, Region VIII, Denver, Colorado (EPA). Comments were solicited and received by EPA during a 45 day period following the distribution of the DEIS. In order to facilitate public comment, EPA held a public hearing on the DEIS on 10 June 1976 at 2:00 p.m. and 7:00 p.m. in the Salt Palace, Suite A, 100 South West Temple, Salt Lake City, Utah.

TABLE I-1

ORIGINAL ADVISORY COMMITTEE MEMBERSHIP

Mr. Gordon Harmston, Director
Department of Natural Resources
State of Utah
438 State Capitol
Salt Lake City, Utah 84114

Mr. Vee Call, Director
Provo-Jordan River Parkway Authority
807 East South Temple
Salt Lake City, Utah

Mr. Dale Carpenter, Director
Industrial Promotion
State of Utah
No. 2 Arrow Press
Suite 200 - 165 S.W. Temple
Salt Lake City, Utah 84101

Dr. Levere Merritt
Brigham Young University
368 ESTB
Provo, Utah 84602

Mr. Charles Wilson, Superintendent
Salt Lake City Water Department
1530 S.W. Temple Street
Salt Lake City, Utah 84115

Mr. Burt Carlson
State Planning Coordinator
State Capitol Building
Room 118
Salt Lake City, Utah

Mr. Calvin K. Sudweeks
Bureau of Environmental Health
44 Medical Drive
Salt Lake City, Utah 84113

Ms. Jan Johnson
Utah Environmental Center
8 East Broadway
Judge Building 610
Salt Lake City, Utah 84111

Mayor William H. Levitt, Chairman
Wasatch Front Regional Council
424 West Center
Bountiful, Utah 84010

Commissioner Harold H. Smith
Chairman
Mountainland Association of Governments
160 East Center Street
Provo, Utah 84601

Mr. Elmo Hamilton, President
Farm Bureau - State of Utah
1758 West 134 South
Riverton, Utah 84066

Ms. Emily Hall
League of Women Voters
2652 East 6200 South
Salt Lake City, Utah 84121

Dr. R. J. Heaney
Utah Copper Division
Kennecott Copper
P. O. Box 11299
Salt Lake City, Utah 84147

Honorable Steven Holbrook
235 Elizabeth
Salt Lake City, Utah

CHAPTER II

BACKGROUND

SOCIAL SETTING

History

The first white men in recorded history to enter Utah Valley were Spanish explorers led by Francisco Antanasio Domínguez and Silvestre Velezde Escalante. They entered the Valley through Spanish Fork Canyon on September 23, 1776. During the early nineteenth century, English and American trappers explored the Utah and Salt Lake Valleys. Among these early explorers were William H. Ashley and Etienne Provost sent by the Rocky Mountain Fur Company to explore and trap mink and beaver. John C. Fremont passed through the Valley in 1843.

A small party of Mormon pioneers led by Brigham Young entered the Salt Lake Valley on July 24, 1847, to establish a permanent settlement. In spite of the lateness of the season, crops were planted, irrigation systems established, and crops harvested that fall. Within two years, Salt Lake City had a population of 5,000 and became one of the fastest growing communities in the West. The town was laid out in square 10-acre blocks that were oriented in north-south and east-west directions. Wide streets were provided between the blocks, and areas were set aside for parks, churches, businesses, and similar uses at the time the city was laid out. Most of the roads in the area are still square with the cardinal points of the compass.

Brigham Young, president of the Mormon Church, sent an exploration party into southern Utah County in 1847. In 1849, John S. Higbee, who had been in the first exploration party, and 30 families, about 150 people, built Fort Utah along the Provo River, about 2.5 miles west of the center of the present City of Provo. The fort wall was 14 feet high and the log houses were on the inside. Small settlements, or towns, were soon established about 6 miles apart for a distance of about 50 miles. These settlements were Mountainville (Alpine), Lehi City, American Fork, Battle Creek (Pleasant Grove), Provo City, Springville, Palmyra City (Spanish Fork), Payson, and Summitville (Santaquin). The people lived within the town limits and farmed areas outside the towns.

The Union Pacific Railroad was completed on November 18, 1873, and the Denver and Rio Grande Western Railway in 1889.

The first newspaper, The Provo Daily Times, was published in the territory south of Salt Lake in 1872.

Members of the Church of Jesus Christ of Latter-Day Saints (Mormon Church) were leaders in the settlement of the Study Area. However, with the discovery of gold in California, came an influx of miners, soldiers, and settlers. Thus developed many years of conflict, both philosophical and physical, involving marital law, anti-Mormon legislation, court expropriation of Church property, and delay of statehood.

Culture

The early Mormon struggles and persecution have resulted in a unique cultural and political heritage which is manifested today in

the Study Area. There is a strong group and family solidarity. People in the Study Area prefer to "take care of themselves." Politically, this has been translated into a strong anti-Federal government outlook. Indeed, Jake Garn, former mayor of Salt Lake City, was elected to the U. S. Senate in 1974, after campaigning on a platform of keeping the federal government out of the State's business.

Because of the strong Mormon influence, there is a tremendous willingness to work hard and to achieve success in all productive endeavors. Mormon principles decry idleness, waste, and luxury, advocate hard, continuous labor, and encourage financial success. These principles have been responsible for strong pro-development feelings among certain sectors of the populace.

As is the case with many other parts of the United States, religious ties are weakening in the Study Area, particularly in the cities. However, the Mormon Church remains a potent influence in shaping the culture of the Utah Lake-Jordan River area.

In the political arena, Democrats presently control both houses of the state legislature for the first time in many years. Governor Calvin L. Rampton, also a Democrat, was re-elected to a third term in 1974. It would appear that the usual liberal-conservative issues and divisions do not fully apply in Utah. There is a strong element of extreme conservatism within the State. Conservative factions, together with land developers and realtors, were considered responsible for defeating a land use bill passed by the legislature in 1973 and referred to the people.

Population Centers

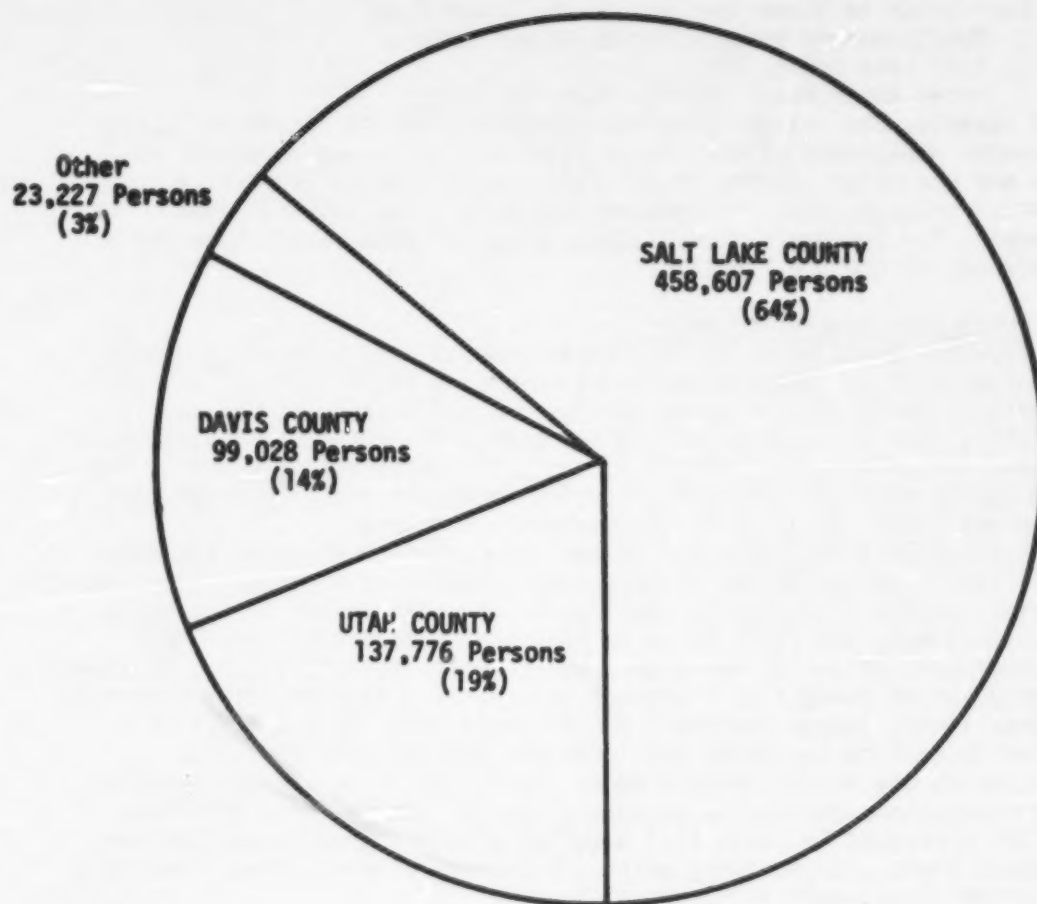
According to the 1970 Census of Population, the total 1970 population of the Study Area was 718,638 persons. This is estimated to be 68 percent of the 1970 population of Utah. Salt Lake County, with a 1970 population of 458,607, has the greatest concentration of population in both the Study Area and the State. Utah County is second in population with 137,776 persons, followed by Davis County with 99,028. The remainder of the Study Area, including portions of Wasatch, Juab, Sanpete, Weber, and Summit Counties have a reported 1970 population of 23,227. The relative populations of these areas are illustrated in Figure II-1.

Local Governments/Agencies

Planning Agencies

Land use planning within the Study Area is influenced primarily by the State, various councils of government, the counties, and city governments. Only the county and city governments have actual regulatory controls. The State agencies:

- . Office of the State Planning Coordinator
 - . Division of Highways
- and the council of governments (COG):
- . Wasatch Front Regional COG
 - . Mountainland Association of Governments
 - . Salt Lake County COG



STUDY AREA POPULATION DISTRIBUTION

FIGURE II-1

normally are involved in developing regional policies, plans, and projections. Except for the Division of Highways, these plans are rarely implementable by the agency.

Under current statutory authority, the city and county planning agencies are permitted to develop land use plans and regulatory controls. Land use regulation is not a statutory requirement, but rather a local option.

In terms of water quality planning, there are currently three 208 Water Quality Management Planning programs underway in the Study Area. Water quality management planning grants under Section 208 of PL 92-500 have been given to three agencies in the Study Area:

- . Mountainlands Association of Governments
- . Salt Lake County COG
- . Weber River Water Quality Planning Agency.

These agencies are charged with the responsibility to develop areawide wastewater management plans. These plans are to include controls on point and non-point sources of pollution, a regulatory program, a financial program, and a management framework. The institutional frameworks for implementation of the wastewater management plans are a key element of the 208 Programs.

Wastewater Control Agencies

The Utah Division of Health, Environmental Health Services Branch is charged with the responsibility of enforcing State laws, rules, and regulations pertaining to water quality and wastewater discharges. Generally, this includes water quality standards, effluent limitations, construction priorities, design approval, and construction grants. The State agency also has responsibility for treatment facility inspection, but operator certification is not currently required.

State statutory authority to own and operate wastewater treatment facilities is vested in any county, incorporated municipality, improvement district, taxing district, or other political subdivision of the State. State law grants the right for such political entities to enter into long-term contracts with any other public owners for collection, treatment and disposal of sewage; to construct or otherwise acquire joint interests in sewer lines, sewage treatment and disposal facilities and sell any portion thereof to any other public owner; and provides for joint operation of any of the jointly owned facilities. The various agencies and jurisdictions owning and operating sewage facilities in the Study Area are presented in Table II-1 together with the area served and the treatment plant and receiving water. Locations of the various treatment plants are illustrated in Figure II-2.

Land Use Patterns

Land within the Study Area is owned by the Federal and State governments and many private entities and individuals. Federal lands are managed by the U. S. Forest Service, U. S. Bureau of Land Management, and the U. S. Department of Defense. The State of Utah owns numerous parks, wildlife refuges, and recreation areas. Private land is held by cities, railroads, industries, churches, and individuals. The distribution of land ownership in the Study Area is illustrated in Figure II-3.

TABLE II-1

WASTEWATER AGENCIES AND TREATMENT PLANTS

<u>County</u>	<u>Agency</u>	<u>Area Served</u>	<u>Treatment Plant</u>	<u>Receiving Water</u>	<u>Map(1) Index</u>
Davis	North Davis County Sewer District	Clearfield	North Davis County Sewer District	Great Salt Lake	1
		East Layton			
		Roy			
		Syracuse			
		West Point			
	Central Davis County Sewer District	Sunset	Central Davis County Sewer District	Haight Creek	2
		Layton			
		Clinton			
		Farmington			
		Kaysville			
	South Davis County Sewer District	Fruit Heights	South Davis County Sewer District - North Plant	State Canal	3
		Bountiful			
		North Salt Lake			
		Bountiful			
		West Bountiful			
Salt Lake	Salt Lake City	Woods Cross	South Davis County Sewer District - South Plant	Jordan River	4
		Centerville			
		Salt Lake City			
		South Salt Lake City			
		Hunter Kearns Granger			
	Chesterfield Improvement District	Chesterfield Improvement District	Salt Lake City	Sewage Canal	5
	Granger-Hunter Improvement District	Granger-Hunter Improvement District	South Salt Lake City	Jordan River	6
	Granger-Hunter Improvement District	Granger-Hunter Improvement District	Granger-Hunter Improvement District	Jordan River	7

TABLE II-1 (Continued)
WASTEWATER AGENCIES AND TREATMENT PLANTS

<u>County</u>	<u>Agency</u>	<u>Area Served</u>	<u>Treatment Plant</u>	<u>Receiving Water</u>	<u>Map (1) Index</u>
Salt Lake (Con't)	Salt Lake City Suburban Sanitation District No. 1	Taylorsville- Bennion Improve- ment District	Salt Lake City Suburban Sanitation District No. 1	Vitro Waste Ditch	8
	Salt Lake County Cotton- wood Sanitation District	Snowbird Cottonwood Area	Salt Lake County Cottonwood S.D.	Big Cottonwood Creek	9
	Murray City	Murray	Murray	Jordan River	10
	Salt Lake County Sewerage Improvement District No. 1	Bluffdale Draper Riverton South Jordan Salt Lake City SSD-2 Midvale West Jordan	Tri-Community	Jordan River	11
	Sandy Suburban Improvement District	Sandy	Sandy	Jordan River	12
	Magna Water & Sewer Improvement District	Magna Area	Magna	Kersey Creek	13
	Copperton City	Copperton	Copperton	Waste Canal	14
	Lark Sewer and Water Corporation		Lark	Keystone Gulch	15
	State of Utah	Utah State Prison	Utah State Prison	(2)	16
	U.S. Government	Camp Williams	Camp Williams	(2)	17

TABLE II-1 (Continued)
WASTEWATER AGENCIES AND TREATMENT PLANTS

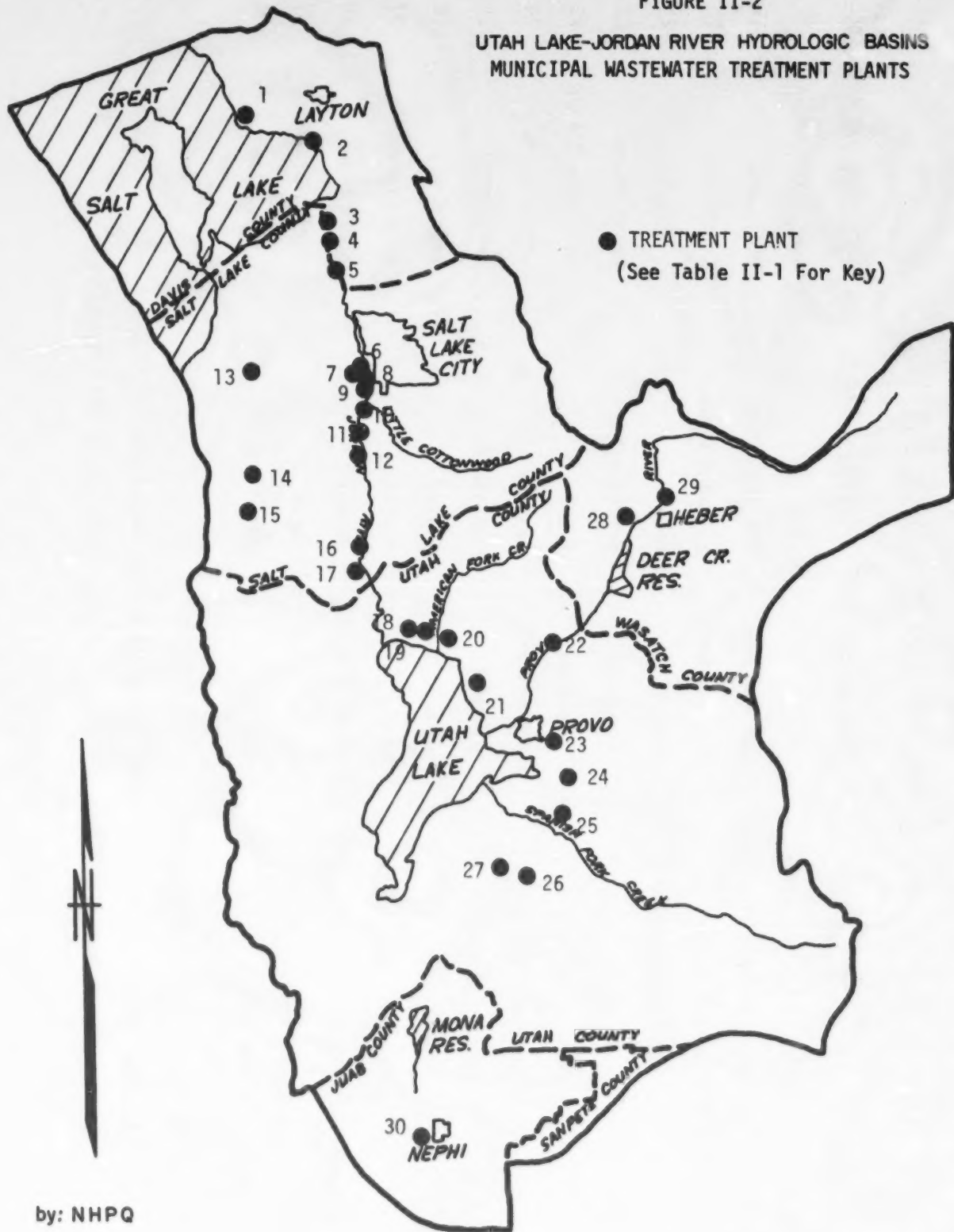
<u>County</u>	<u>Agency</u>	<u>Area Served</u>	<u>Treatment Plant</u>	<u>Receiving Water</u>	<u>Map (1). Index</u>
Utah	Lehi City	Lehi	Lehi	Utah Lake	18
	American Fork City	American Fork	American Fork	Utah Lake	19
	Pleasant Grove City	Pleasant Grove	Pleasant Grove	Irrigation	20
	Orem City	Orem	Orem	Utah Lake	21
	Springdell	Springdell	Springdell	Provo River	22
	Provo City	Provo Area	Provo	Mill Race Stream	23
	Springville City	Springville	Springville	Spring Creek	24
	Spanish Fork City	Spanish Fork	Spanish Fork	Irrigation	25
	Salem City	Salem	Salem	Beer Creek	26
	Payson City	Payson	Payson	Beer Creek	27
Wasatch	Midway Sanitation Dist.	Midway Area	Midway	Snake Creek	28
Juab	Heber City	Heber	Heber	Spring Creek	29
	Nephi City	Nephi	Nephi	Irrigation	30

NOTES:

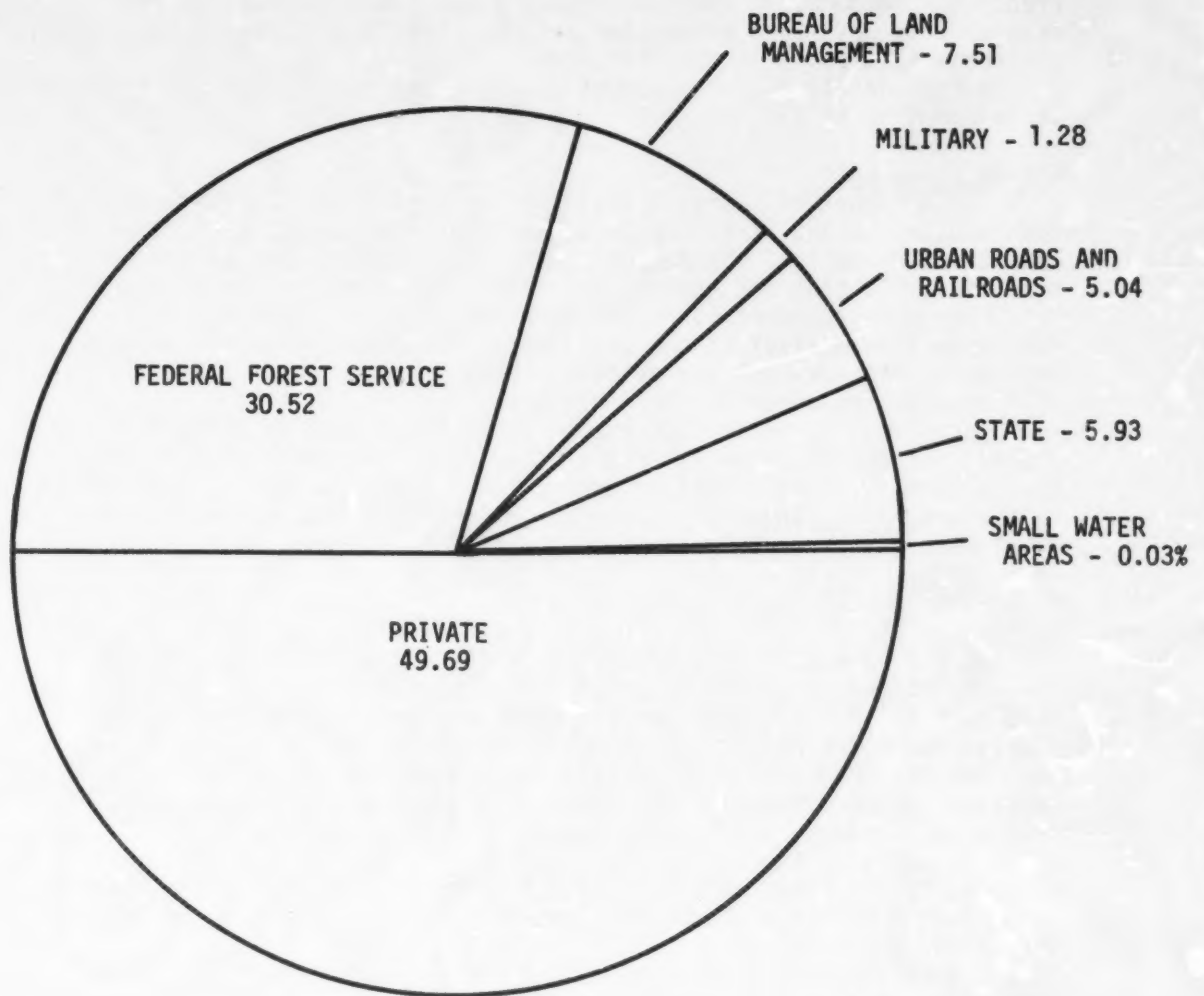
1. Map index is keyed to treatment plant locations illustrated in Figure III-2.
2. Utah State Prison and Camp Williams are being connected to Tri-Community.

FIGURE II-2

UTAH LAKE-JORDAN RIVER HYDROLOGIC BASINS
MUNICIPAL WASTEWATER TREATMENT PLANTS



by: NHPQ



PRESENT LAND OWNERSHIP

FIGURE II-3

The existing land use distribution is illustrated in Figure II-4. Approximately two-thirds of the Study Area land is occupied by forests and mountain areas. Within the developed areas, agriculture is the predominate land use, with 16.7 percent of the total land area.

The canyons and mountain lands are used extensively for winter and summer recreation as well as a water supply source. Residential development of the canyons is minimal, however development pressure is increasing. Reconciling the conflicting future land use desires for development, watershed protection, and preservation is one of the major environmental issues in the Study Area.

A more detailed discussion of existing and future land use is presented in Chapter III.

Growth Stimulants

For a number of years, a specific State goal was the attraction of new industry to the State. Indeed, the State has set up a Division of Industrial Promotion. In recent years, industrial promotion has been selective, planning for growth, and sensitive to environmental issues.

Energy development is on the increase in Utah. Although this development is minimal in the Study Area, the competition for natural and human resources for energy development in other parts of the State will have an influence in the Study Area.

Industrial promotion and energy development must be thought of as significant growth stimuli in the Study Area. However, as development occurs there will be a loss of agricultural land. Because of the strong cultural feelings towards stewardship of the land, these dichotomous development stresses may become a significant land use issue in the future.

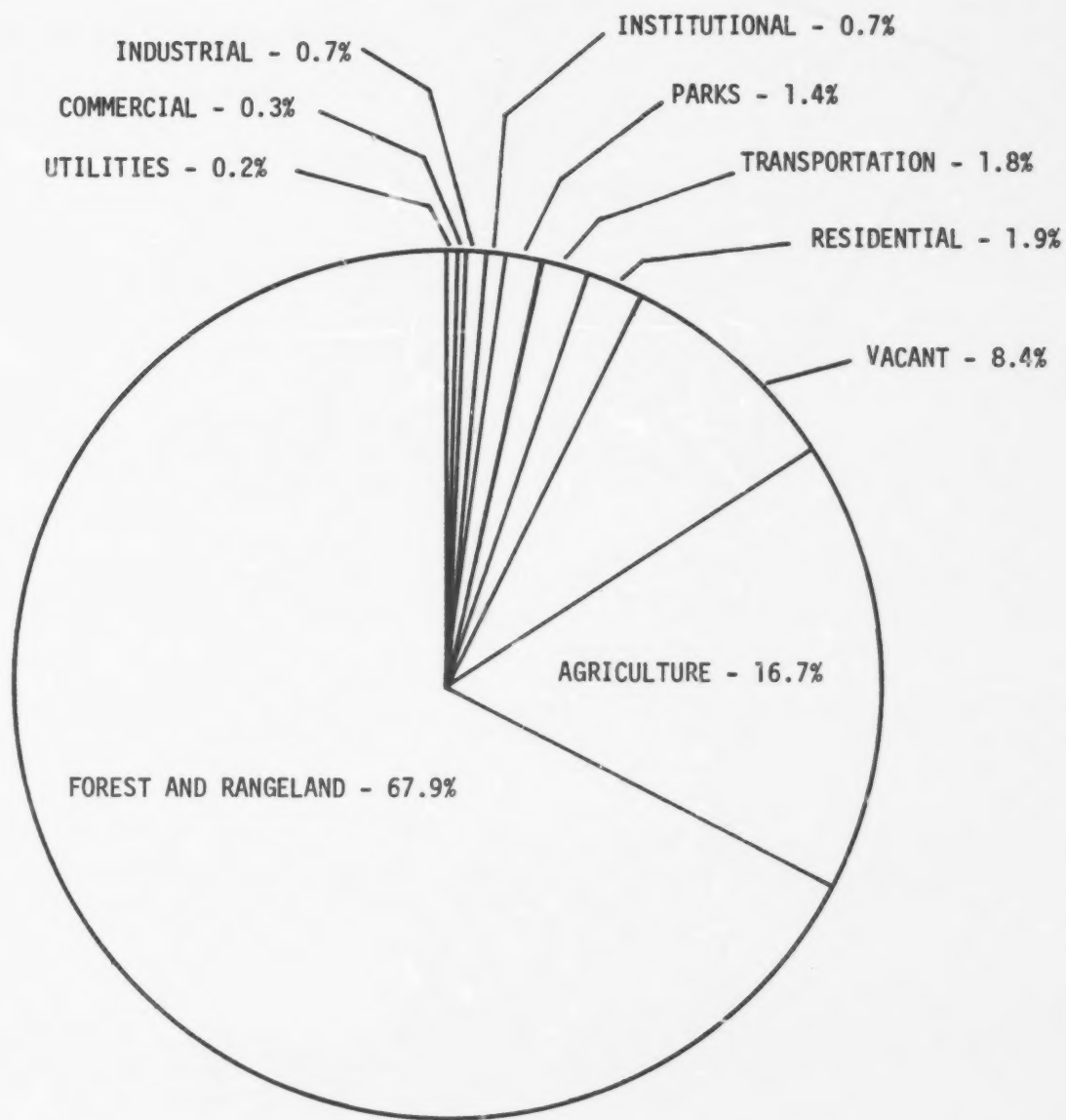
ENVIRONMENTAL SETTING

Geography

As illustrated in Figure II-5, the Study Area includes two major drainage basins, the Utah Lake Basin and the Salt Lake Valley. The Salt Lake Valley is bounded on the east and northeast by the Wasatch Mountains, on the west by the Oquirrh Mountains, and on the south by the Traverse Mountains. The Wasatch Mountains rise abruptly from valley terraces at approximately 5,000 feet to 11,000 feet above sea level. In similar fashion, the Oquirrh Mountains rise approximately 9,000 feet above sea level. The northwestern sector of the Salt Lake Valley is bordered by the Great Salt Lake at 4,200 feet and adjacent lake bottoms. The Traverse Mountains, at 6,500 feet above sea level, form the southern end of the Valley.

The Salt Lake Valley is roughly 31 miles long and has an approximate width of 23 miles. Approximately 68 percent of the 780 square mile drainage area lies within the valley while the remaining 32 percent lies in the surrounding mountains.

From the base of the Wasatch and Oquirrh Mountains, the valley consists of a series of terraces which slope gradually away from the mountains and terminate at an abrupt drop to the next terrace in the series. These terraces were formed by the actions of the ancient Lake

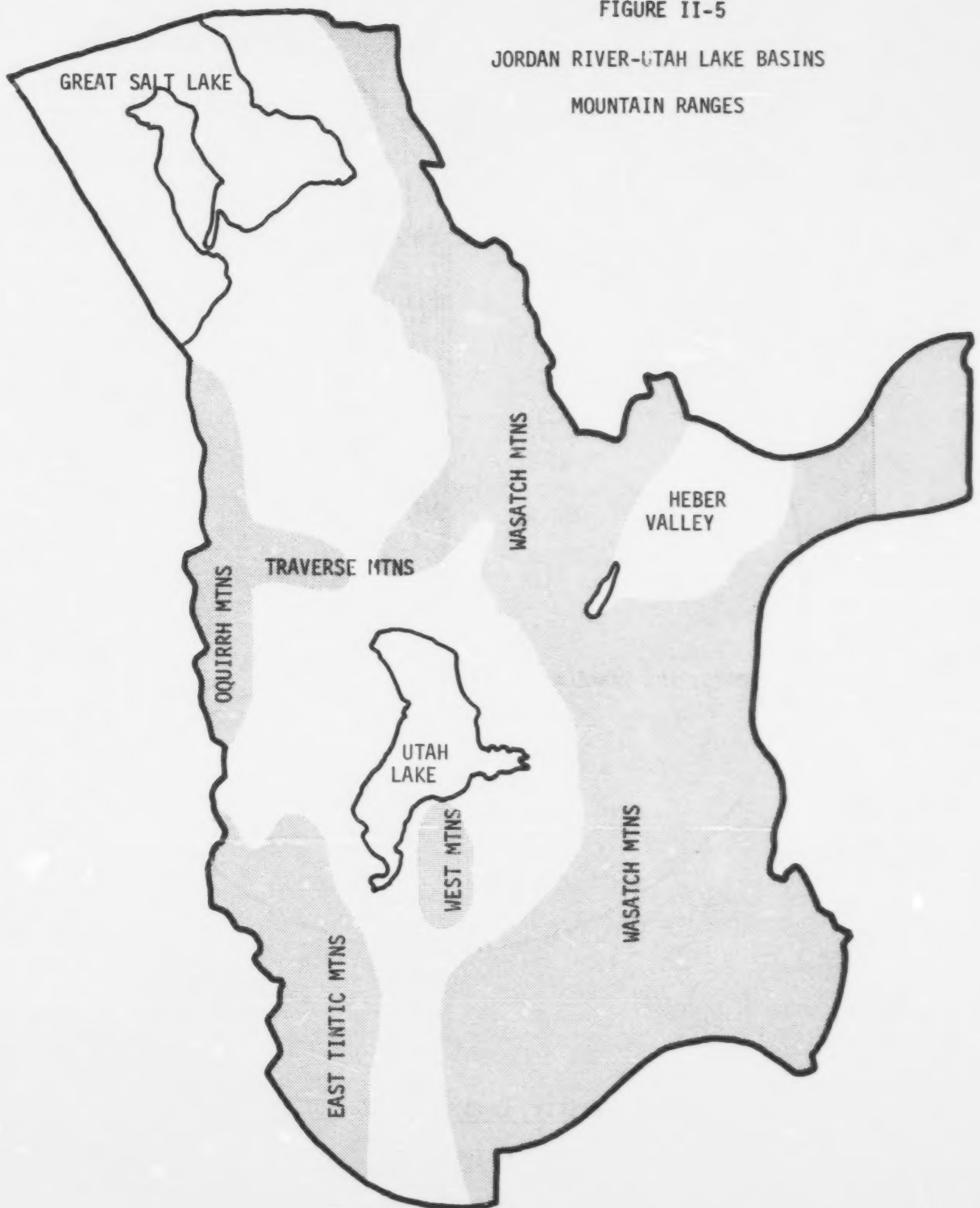


EXISTING LAND USE DISTRIBUTION

FIGURE II-4

FIGURE II-5

JORDAN RIVER-UTAH LAKE BASINS
MOUNTAIN RANGES



Bonneville. Lake Bonneville once covered more than 20,000 square miles and was centered in this area. Its highest level was 1,000 feet above the present water level of the Great Salt Lake, at which time it was a freshwater lake. In profile the valley floor is a series of steps leading up from the Jordan River. In contrast to this is the area adjacent to Great Salt Lake where the surface lacks contours and is a broad flat plain.

The Jordan River bisects the valley from north to south and is the principal drainage stream of the Salt Lake Valley. As illustrated in Figure II-6, the major tributaries of the Jordan River arise from the west slope of the Wasatch Mountains while the Jordan River flows from the Utah Lake Basin to the Great Salt Lake.

The Utah Lake Basin, which includes Heber Valley and Utah Valley, is the southernmost basin of the Wasatch Front. The Heber Valley is approximately fifteen miles northeast of Utah Valley at an elevation of between 5,400 and 5,700 feet above sea level. The Wasatch Mountains surround this valley. The Provo River is the sole drainage out of the valley.

As illustrated in Figure II-5, the Utah Valley is surrounded on all sides by mountains. To the west are the East Tintic Mountains, the Lake Mountains and West Mountains, with highest elevations of 8,200, 7,500, and 8,500 feet, respectively. The northern border is formed by the Traverse Mountains, the common boundary of the Utah Lake Basin and Salt Lake Valley. The southern border is formed by the convergence of the East Tintic and Wasatch Mountains as they form a low ridge. The eastern border is formed by the Wasatch Mountains.

Utah Valley is about 35 miles long and 12 miles wide. The valley floor, like the Salt Lake Valley, consists of several terraces which have been formed by Lake Bonneville.

As shown in Figure II-6, major streams that drain into Utah Lake originate in the Wasatch Mountains on the east. Utah Lake is a shallow seven to eight feet average depth, freshwater lake covering about 150 square miles at an elevation of approximately 4,400 feet. The Jordan River drains Utah Lake to the north. Roughly seven miles from its head, Jordan River passes through the Jordan Narrows in the Traverse Mountains.

Geology

The following discussion relates to the geologic history and character of the Study Area. To assist the reader in understanding the time frame of the discussion, a geologic time scale is presented in Figure II-7.

The geologic composition of the Study Area is complex and includes sedimentary, igneous, and metamorphic rock ranging in age from Pre-Cambrian through Quaternary. The area has been involved in recurring major structural deformation from Pre-Cambrian time through late Cretaceous (Laramide deformation) and early Tertiary time with severe deformation, overturning, and faulting of the Wasatch Mountains.

The Salt Lake and Utah Valleys are small parts of a larger area that, during the glacial epoch, was covered by ancient Lake Bonneville. At its greatest extent, the Lake had a maximum length of 350 miles, a width of about 145 miles.

FIGURE II-6
MAJOR HYDROLOGIC FEATURES
OF
UTAH LAKE-JORDAN RIVER BASINS

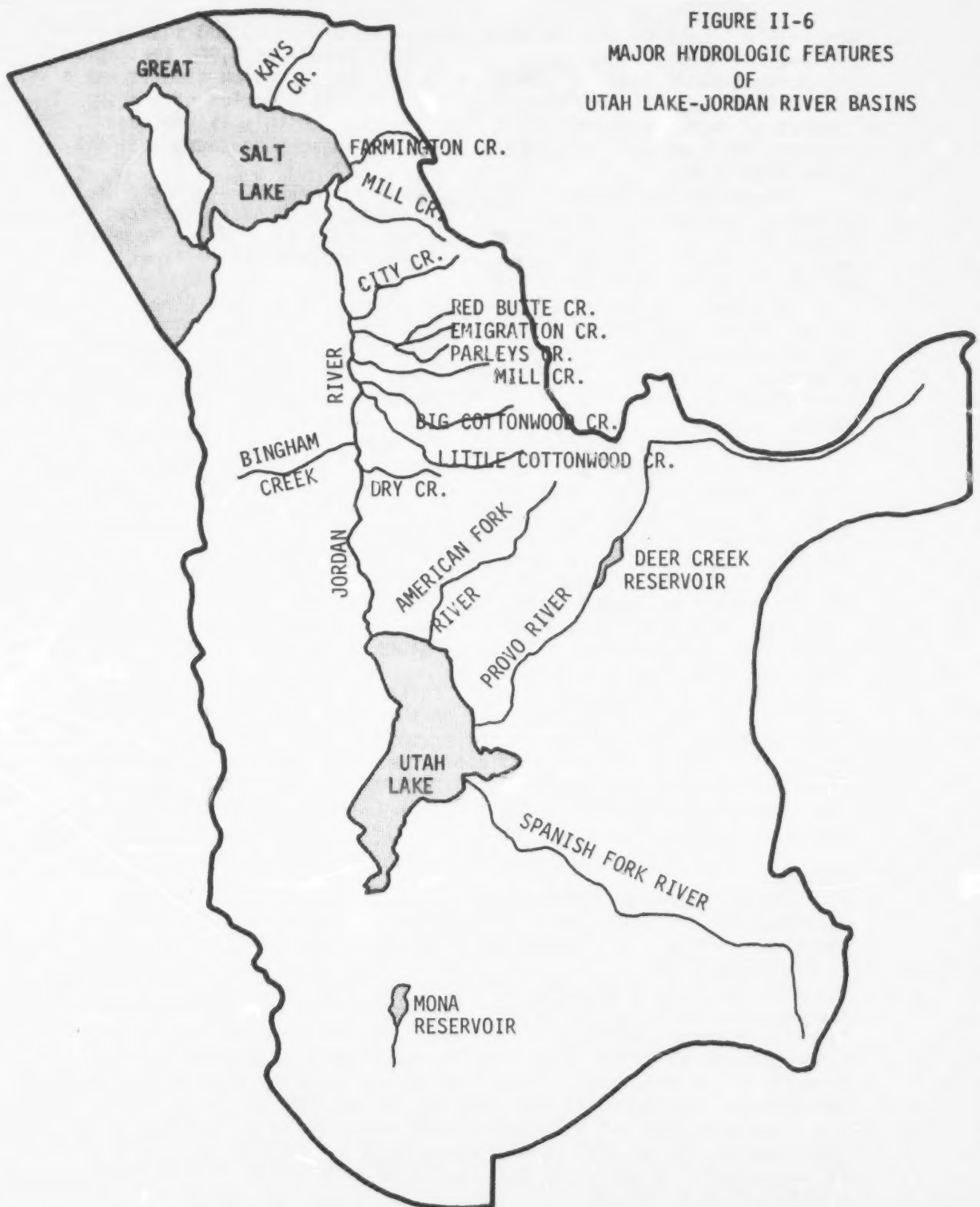


FIGURE II-7
GEOLOGIC TIME SCALE

Era	Period	Epoch	Age in Years before Present	Major Geologic Events in United States given in Order of Increasing Age	Distinctive Features of Plant and Animal Life			
CENOZOIC	QUATERNARY	RECENT		Minor changes in landforms by work of streams, waves, wind.	Rise of civilizations.	AGE OF MAN		
			10,000					
	TERTIARY	PLEISTOCENE		Four stages of spread of continental ice sheets and mountain glaciers.	Development of man. Extinction of large mammals.	AGE OF MAMMALS		
			1,000,000	Cascadian orogeny: Cascade and Sierra Nevada ranges uplifted; volcanoes built;				
		PLIOCENE			Early evolution of man. Dominance of elephants, horses, and large carnivores.			
			13,000,000					
		MIOCENE		Marine sediments deposited on Atlantic and Gulf Coastal Plains. Stream deposits spread over Great Plains and Rocky Mountains basins.	Development of whales, bats, monkeys.			
			25,000,000		Rise of anthropoids.			
		OLIGOCENE		Thick marine sediments deposited in Pacific coastal region.	Development of primitive mammals. Rise of grasses, cereals, fruits.			
			36,000,000					
		EOCENE						
			58,000,000					
	PALEOCENE		Laramide orogeny: Rocky Mountains formed.	Earliest horses.				
		63,000,000						
MESOZOIC	CRETACEOUS		Marine-sediment deposition over Atlantic and Gulf Coastal Plains and in geosyncline of Rocky Mountains region.	Extinction of dinosaurs. Development of flowering plants.	AGE OF REPTILES			
			135,000,000	Nevadian orogeny: Intrusion of batholith of Sierra Nevada region.				
	JURASSIC		Marine-sediment deposition in seas of western United States. Desert sands deposited in Colorado Plateau.	Culmination of dinosaurs. First birds appear.		AGE OF REPTILES		
			180,000,000	Palisadian disturbance: Block faulting in eastern United States.				
	TRIASSIC		Deposition of red beds in fault basins of eastern United States and in shallow basins in western United States.	First dinosaurs. First primitive mammals. Spread of cycads and conifers.		AGE OF REPTILES		
			230,000,000	Appalachian orogeny: Folding of Paleozoic strata of Appalachian geosyncline.				
PALEOZOIC	PERMIAN		Deposition of red shales and limestones in southwestern United States; much salt and gypsum. (Glaciation of Southern Hemisphere continents.)	Conifers abundant. Reptiles developed. Spread of insects and amphibians. Trilobites become extinct.	AGE OF AMPHIBIANS			
			280,000,000					
	CARBONIFEROUS	PENNSYLVANIAN		Deposition of coal-bearing strata in eastern and central United States.		Widespread forests of coal-forming, spore-bearing plants. First reptiles. Abundant insects.	AGE OF AMPHIBIANS	
			310,000,000					
	MISSISSIPPIAN		Deposition of limy, shaly sediments in widespread shallow seas of central and eastern United States.	Spread of sharks. Culmination of crinoids.		AGE OF AMPHIBIANS		
			345,000,000	Acadian orogeny: Folding and igneous-rock intrusion in New England.				
	DEVONIAN					First amphibians. Many corals. Earliest forests spread over lands.	AGE OF FISHES	
			405,000,000	Deposition of thick marine strata in geosynclines of eastern and western United States.				
		SILURIAN				First land plants and air-breathing animals. Development of fishes.		AGE OF FISHES
				425,000,000		Taconian orogeny: Folding of rocks in eastern United States, Nevada, and Utah.		
ORDOVICIAN					Life only in seas. Spread of mollusks. Culmination of trilobites.	AGE OF MARINE INVERTEBRATES		
		500,000,000	Deposition of thick marine strata in geosynclines of eastern and western United States.					
CAMBRIAN				Trilobites predominant. Many marine invertebrates.	AGE OF MARINE INVERTEBRATES			
		600,000,000						
Precambrian time.			Age goes back to nearly 3 billion years	Many periods of sediment deposition alternating with orogeny.	Earliest known forms of life. Few fossils known.			

SOURCE: After A. N. Strahler (1960), *Physical Geography*, John Wiley & Sons, New York.

The sediments of the Jordan Valley and Utah Lake Basin were derived from material deposited by Lake Bonneville and possibly from earlier lakes that may have occupied the area. Where streams entered the lake, their velocities were checked, and the coarser sediments were deposited near the lakeshore while finer sediments were carried out into the lake before being deposited. For the most part, sediments brought into the valleys by the mountain streams did not remain undisturbed but were reshaped by the action of waves and shore currents. The product of this activity is the wave-cut terraces or benches and the bars and spits that are a conspicuous feature of the present topography.

The Jordan River was formed 11,000 to 12,000 years ago when the main body of Lake Bonneville, on the Salt Lake Valley side, started to drop. The remaining part of the Lake on the Utah Valley side was sustained by the Provo River. It eventually overflowed a naturally formed barrier between the two valleys during higher lake stages thus forming the Jordan Narrows.

The Heber Valley is on the transitional zone between the Wasatch and Uintah Mountain Ranges. A portion of the Valley is underlain by Tertiary volcanic rocks giving rise to the predominance of high water tables in the area.

Faulting is present within the Study Area and is of concern in terms of location of interceptors, treatment plants, etc. Approximate fault locations are shown in Figure II-8 to occur along the boundary between the Basin and Range province and the Colorado Plateau Middle Rocky Mountain provinces. This is part of the belt of fault that extends from the Gulf of California north into British Columbia.

The Wasatch fault zone is one of the major zones of crustal displacement in the Study Area and is still active. The fault line parallels the west base of the Wasatch Mountain range and has a westward dip. This can cause a displacement of an earthquake epicenter to the west. Such a situation can cause major damage westward throughout the Salt Lake and Utah Lake Valleys.

Faulting is also present within the Heber Valley and is the result of uplift and forces related to intrusion of the large igneous stocks. Fault zones known and mapped by mining companies cross the valley from the Mayflower mine on the west to the vicinity of the Park Premier shaft on the east of the valley.

Soils

The soils within the two hydrologic basins have characteristics that were influenced both by glaciers and by ancient Lake Bonneville. Four basic soil types are found within the area.

The soils surrounding and underlying the Great Salt Lake, Jordan River, and portions of Utah Lake are heavy-clay textured, poorly drained, high in organic content, low in density and are commonly high in alkali content. The water table is usually very high in these areas. The soils are generally unsuited for agriculture or urban development without special treatment.

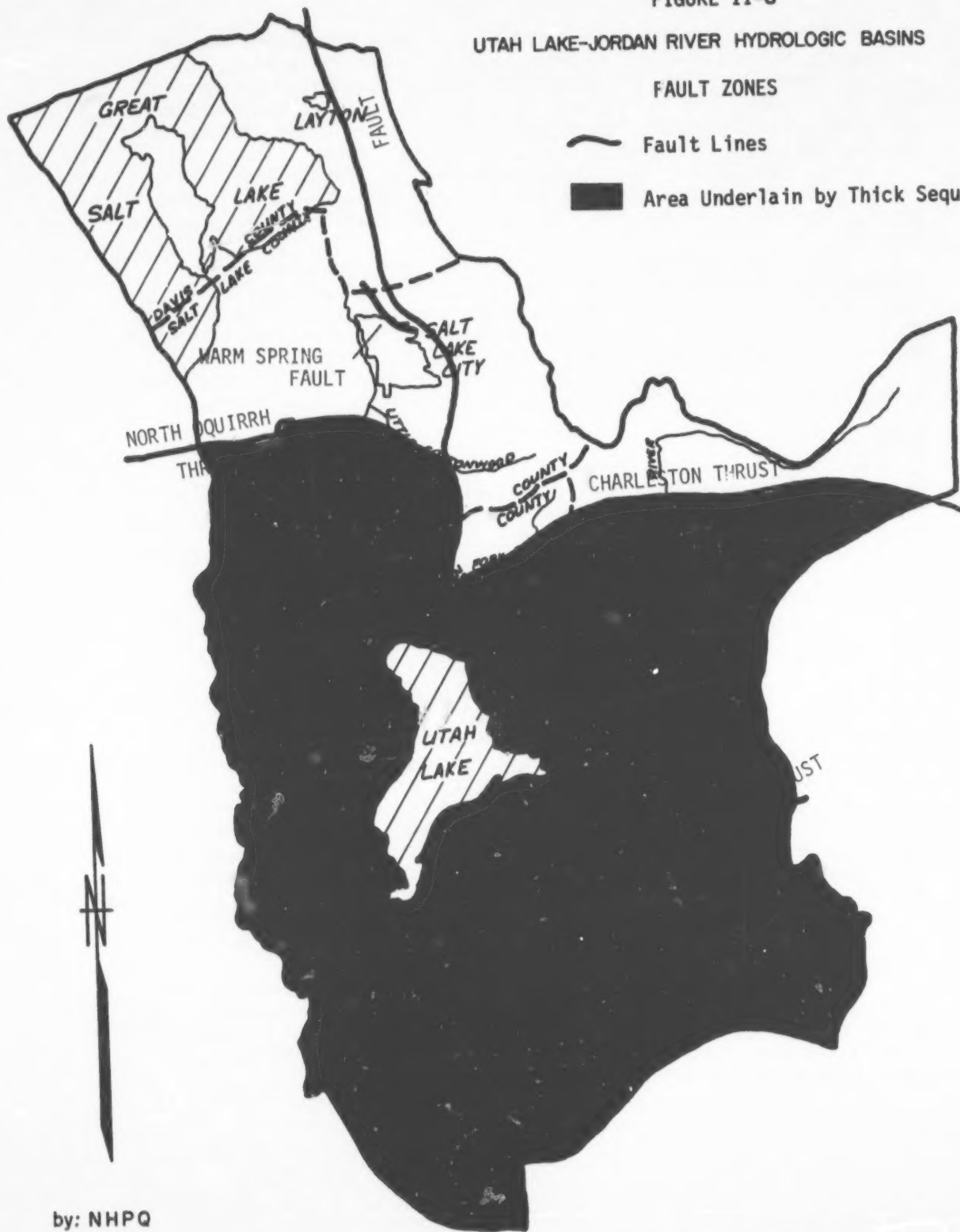
FIGURE II-8

UTAH LAKE-JORDAN RIVER HYDROLOGIC BASINS

FAULT ZONES

— Fault Lines

■ Area Underlain by Thick Sequences



by: NHPQ

Soils located on low lake terraces are loamy in texture and are moderately to well drained. Alkali content is generally high, but organic content is less and subsurface density is similar to adjacent soils surrounding the lake areas. A wide variety of crops is produced on these soils. Several communities comprising the major portion of the basin's population are located on these soil types.

Soils located on high lake terraces consist primarily of sand, silts, and clay similar to those found on the lower terraces, together with coarser material found in the numerous alluvial fans and glacial moraines.

Soils in the mountainous areas are coarse textured and well drained and are composed of gravels and boulders resulting from extensive glacial activity, stream erosion, or landslide action in many of the canyon areas. These soils are generally unsuited for tillage or development due to steep slopes or thin soil horizons.

Generalized soil maps for portions of Davis, Salt Lake, and Utah Counties are presented in Figures II-9, 10, and 11, respectively.

Climate

Great Salt Lake and the surrounding mountain ranges greatly influence the climatology of the Study Area. These two features are greatly responsible for the transitional climate of the area that can be described as semi-continental and semi-arid.

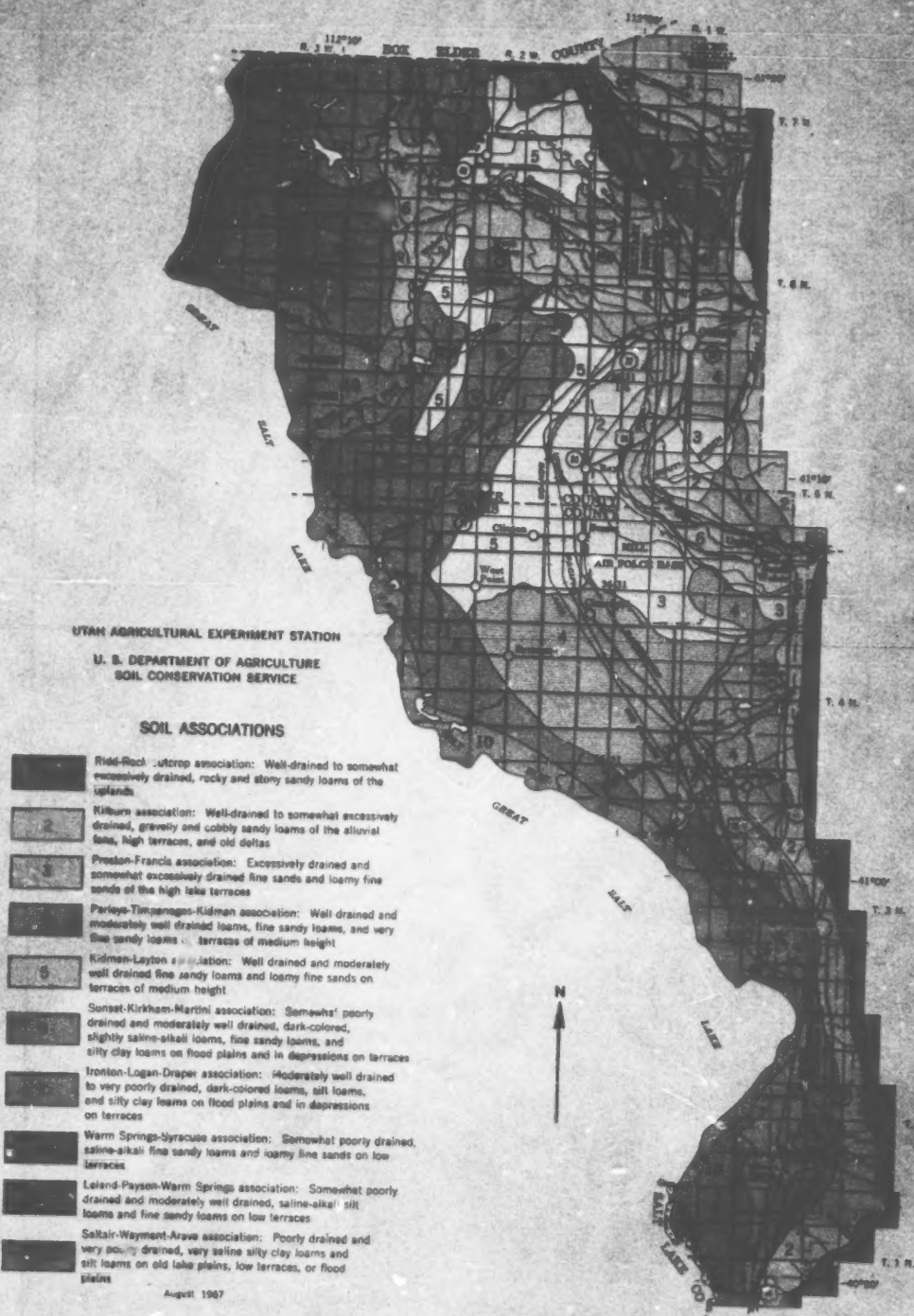
The Study Area has four well-defined seasons which are manifested by:

- . relatively low humidity
- . abundant sunshine, except in winter and early spring
- . relatively light precipitation
- . wide variations in temperature throughout the year.

About 60 percent of the annual precipitation falls in winter and spring, the wettest part of the year. Winter and spring storms develop over the Pacific Ocean from October to May and move eastward through Utah. These are orographic type storms: storms caused by moist air being forced up over a topographic barrier, as the moist air rises, the cooler air condenses the water vapor into droplets and ice crystals. Summer precipitation is associated with thunderstorms that develop as masses of moist air that move northward from the Gulf of Mexico. Near the Great Salt Lake average annual precipitation ranges from 12 to 15 inches, while in the Wasatch Mountains, the precipitation received totals 35 to 40 inches, with isolated areas receiving as much as 60 inches per year. Average annual precipitation at selected stations in the Study Area is illustrated in Figure II-12.

The surrounding mountains also influence the temperature of the Study Area. In the Salt Lake Valley, the most influencing natural condition modifying the temperature is the Great Salt Lake. Because of its high salt content, this body of water never freezes. This has a moderating effect on the temperature of the valley.

FIGURE 11-9
GENERAL SOIL MAP
DAVIS-WEBER AREA, UTAH



SOIL ASSOCIATIONS

DOMINANTLY NEARLY LEVEL AND VERY SLIGHTLY SLOPING TO VERY STEEP SLOPES, TERRACES, PLAINS AND FLOOD PLAINS

Schier-Jordan-Lake association: Poorly drained and very poorly drained, nearly level soils on low plains

Dickman-Lake-Terrace association: Somewhat poorly drained, nearly level soils on low plains

Chippewa-Lake-Terrace association: Poorly drained and very poorly drained soils on flood plains

DOMINANTLY NEARLY LEVEL TO SLOPING, EXCESSIVELY DRAINAGE TO POORLY DRAINAGE SOILS ON LAKE TERRACES AND ALLUVIAL FANS

Blackhawk-Taylor-Lake association: Well-drained to poorly drained soils on low and intermediate terraces

Kidman-Parley-Lake association: Well-drained soils on intermediate terraces

Brigham-Parley association: Well-drained soils on high lake terraces

Kirkman-Parley association: Somewhat excessively drained to excessively drained, gently sloping to steep soils on high lake terraces and fans

DOMINANTLY STEADILY SLOPING TO VERY STEEP, WELL-DRAINAGE SOILS ON MOUNTAINS

Emery-Lake-Rock association: Dominantly shallow soils and Rock land derived from mixed sedimentary rocks on low mountains

Van Wagner-Rock association: Shallow soils and Rock land derived from granite rocks on low mountains

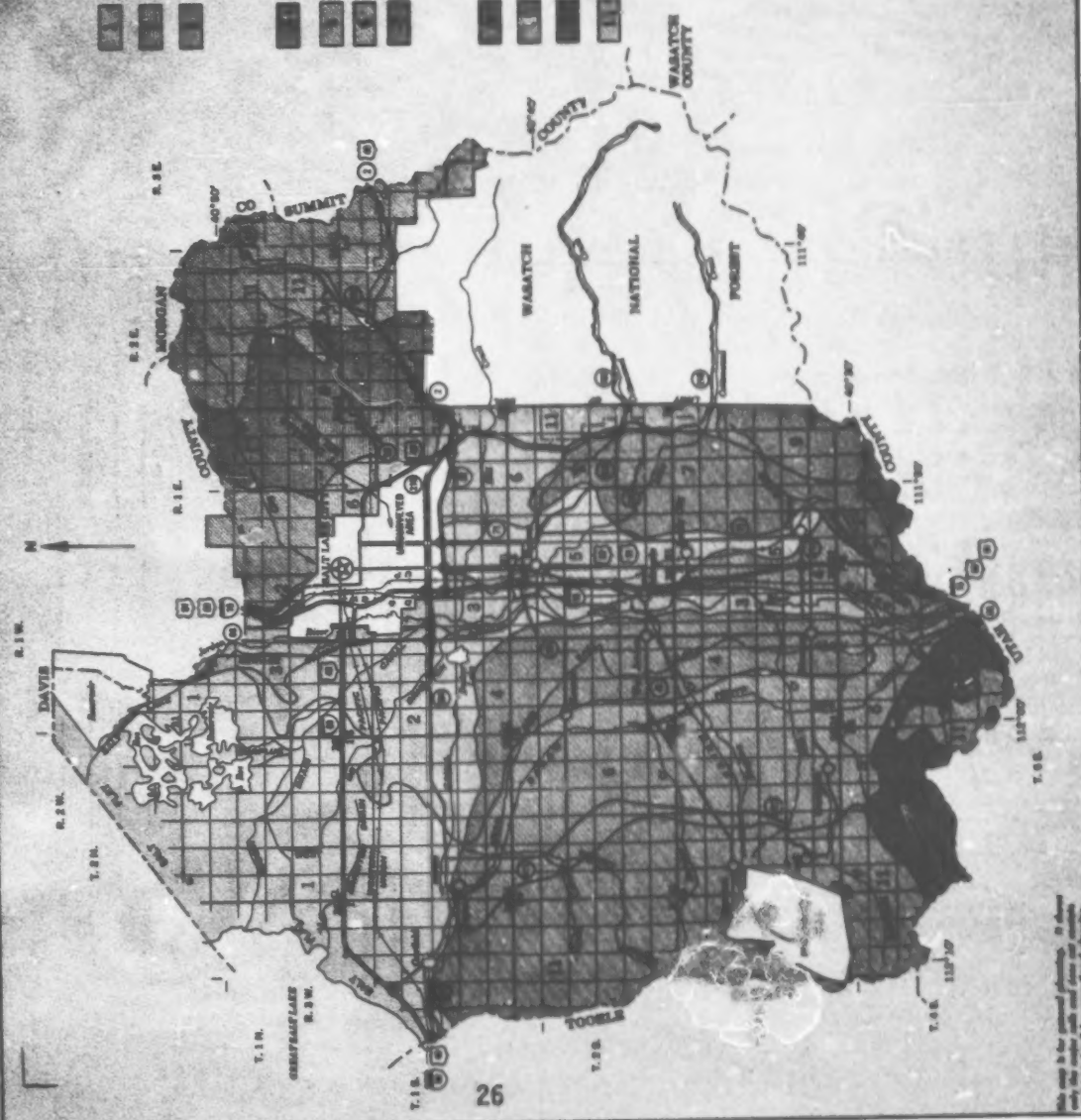
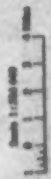
Burns-Rock association: Dominantly moderately deep and deep, stony soils derived from granite rocks on low mountains

Harlow-Rock-Lake association: Deep to shallow soils derived from mixed sedimentary rocks on high mountains

Compiled 1975

FIGURE 11-10

U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE
UTAH AGRICULTURAL EXPERIMENT STATION
GENERAL SOIL MAP
SALT LAKE AREA, UTAH



This map is for general planning. It does not show the exact boundaries of the various soil associations.

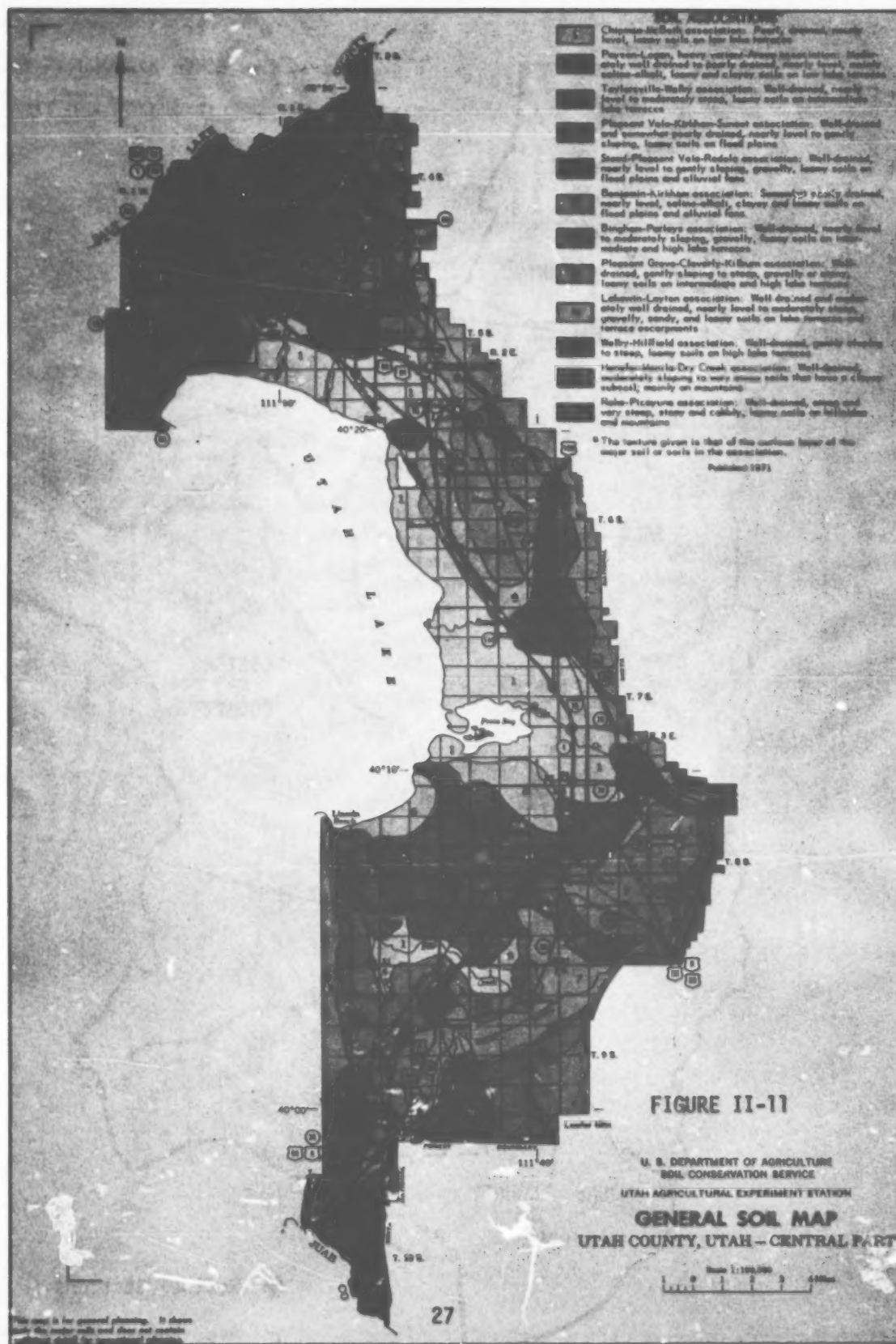
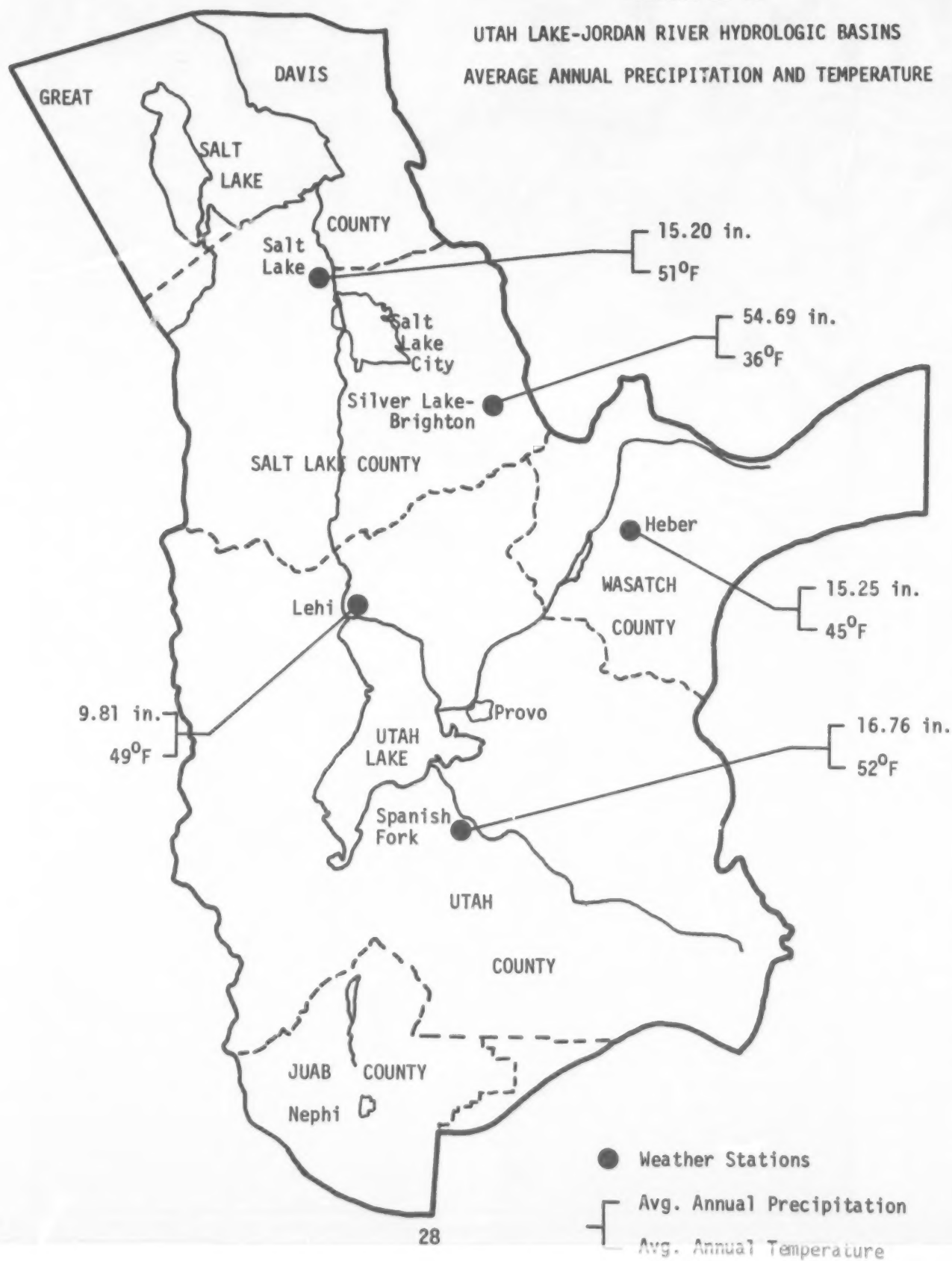


FIGURE II-12

UTAH LAKE-JORDAN RIVER HYDROLOGIC BASINS
AVERAGE ANNUAL PRECIPITATION AND TEMPERATURE



Due to the surrounding mountains, there is a tendency for cold air to pool at the bottom of valleys and to form strong inversions during the colder parts of the year. The intensity of these inversions is demonstrated by the variations in growing seasons near Utah Lake and those on the higher terraces. At Provo, near the Lake, the growing season is only 126 days. At Utah Lake-Lehi, at the northern end of the Lake, the average frost-free period is 132 days and is 167 days at Spanish Fork.

Notwithstanding the cold air pools, temperatures vary with changes in elevation, dropping as elevations increase. The average daily temperature varies most from June to October and least from December to February. As illustrated in Figure II-12, average annual temperatures range from about 51°F. near the Great Salt Lake to about 36°F. in the Wasatch Mountains.

Wind in the Study Area is highly variable depending upon location. Normal wind patterns are determined by topography. Essentially they are upslope during the warm part of the 24-hour period, and downslope during the cool part. These winds can be overridden by strong winds associated with frontal systems which may blow for 24 to 36 hours from the south before a storm. Following a storm, the winds shift to the north and occasionally blow at more than 90 miles per hour. Extremely strong winds occur occasionally during the middle of the summer with local thunderstorms.

Generally, the climate of the area is variable but is not extreme. The mountain ranges act as barriers normally preventing the movement of Arctic air masses from entering the valley.

Terrestrial and Aquatic Ecosystems

A generalized ecosystem unit classification system for the Study Area is presented in Table II-2. The approximate geographic boundaries of each unit are illustrated in Figure II-13. An inventory of the flora and fauna of the Study Area is presented in Volume C-1000, "Definition of the Existing Data Base for the Natural Environmental Setting," of the Study Task Report Series.

The Great Salt Lake Desert ecosystem is limited to the area surrounding the Great Salt Lake in the Study Area. Major biotic communities include marsh, juniper, mixed brush, greasewood, shadscale, and vegetated dune.

The desert habitat types are dominated by small mammals and birds. Typical of the desert communities are the black-tailed jack rabbit, several species of ground squirrels, and the kangaroo rat. Only the red-shouldered hawk and the burrowing owl are confined to the Salt Desert.

While the climate of this area can be described as desert, much of the land is marshland. This marshland is a strip of land about seventy miles long and two to eighteen miles wide on the southeastern shore of the Great Salt Lake. Much of the marshland has been developed by diking and impounding waters that formerly drained into Great Salt Lake. Development has been by private, state, and federal agencies.

TABLE II-2
SELECTED ECOSYSTEM UNITS FOR JORDAN RIVER-UTAH LAKE BASINS

<u>Ecosystems</u>	<u>*Altitudinal Limits</u>	<u>Average Annual Precipitation</u>	<u>Frost Free Period</u>
Great Salt Lake Desert	4200 to 4300	11 to 16	130 to 190
Grass-Sagebrush	4300 to 6000	14 to 18	160
Lower Montane	6000 to 7500	18 to 25	95
Upper Montane	7500 to 9000	25 to 35	65
Subalpine	9000 to 11,000	35	65

*Ecosystem boundaries are not sharp; consequently these figures are only approximations.

FIGURE II-13

UTAH LAKE-JORDAN RIVER HYDROLOGIC BASINS

GENERALIZED ECOSYSTEMS OF THE JORDAN RIVER-UTAH LAKE BASINS



A consequence of this development is the production of great numbers of mosquitoes and other insect pests and vectors ("Environmental Studies of Proposed Jordanelle Reservoir, Provo River, Utah Lake, Jordan River, and Proposed Lampton Reservoir Site," Brigham Young University, April 1975).

The Grass-Sagebrush ecosystem has experienced the greatest transition of the ecosystems within the Study Area. The major urban and rural communities have developed in this ecosystem which includes the broad Utah Lake and Jordan River Valleys. These valley grasslands have been converted to irrigation and agriculture. Very little pristine vegetation remains. Various communities within the Grass-Sagebrush ecosystem are: the grass-sagebrush, wet meadow-stream side willow, mountain brush and marsh. Man's activities in the Grass-Sagebrush ecosystem have displaced many of the indigenous animals of the area. The niche these native organisms occupied has been filled by introduced and domestic species. Upland game such as pheasant and mourning dove abide in large number and compete with smaller populations of chukar partridge, sage and forest grouse, and quail.

Utah Lake is the largest fresh water lake in Utah and is within the Grass-Sagebrush ecosystem. The Lake averages about 8 feet in depth and receives water from tributary streams flowing from the Wasatch Mountains. Principal tributary streams are: American Fork, Provo River, and Spanish Fork. The Jordan River drains Utah Lake to the north. The various aquatic and semi-aquatic communities support a very diverse flora and fauna. Utah Lake has two wildlife marsh areas that are of significance, Provo Bay and Goshen Bay.

The dominant shore line aquatic herbaceous community of Utah Lake is either bulrush or cattail, depending on water depth in Utah Lake. Semi-aquatic herbaceous communities are dominated by bulrush, sedge, and spikerush. These communities typically experience flooding with shallow waters and alternate dry periods. The salt grass community may or may not have greasewood associated with it. However, in Goshen Bay there is a well defined saltgrass - greasewood community.

These communities all provide important wildlife habitat for some 20 species of fish, numerous resident and migratory birds, small mammals, and upland game. Utah Lake currently supports a population of channel catfish considered one of the best in the Intermountain States. Other significant warm water game fish include walleye and white bass. Spawning areas have not been defined but it is known that catfish and other game fish utilize the rocky shore area along the east shores of Goshen Bay and Provo Bay.

The various habitat communities adjacent to the Jordan River are predominantly agricultural lands. Through disturbance, the indigenous plant communities have been replaced by exotic types. A limited area of Grass-Sagebrush exists in the vicinity of the Jordan Narrows.

The Heber Valley is completely within the Grass-Sagebrush ecosystem. The dominant community is the sagebrush with stands of oakbrush and agricultural development. Stands of oakbrush increase in density with an increase in elevation. This occurs in both the Heber Valley and along the slopes rising from the Utah Lake-Jordan River Valley.

The Lower Montane ecosystem is characterized by a climax community of Ponderosa pine (yellow pine) - Douglas Fir - White Fir. Intermixed throughout this community are subclimax stands of quaking aspen and lodgepole pine.

Englemann Spruce - Subalpine Fir form the dominant vegetation associations in the Upper Montane ecosystem. This spruce-fir association is limited to the higher elevations and covers only small portions of the Study Area.

The Lower and Upper Montane ecosystems provide diverse habitats of cover and living space, and food and water requirements for an abundant and varied wildlife. Animals are likely to migrate between the Lower and Upper Montane. Therefore, an inventory of organisms produces a list of species that could be considered common to both. Animals shy to encroachment into their habitat may tend to exist at the high elevations. Dominant species include Rocky Mountain Mule Deer, yellow-haired porcupine, and snowshoe rabbit. Small mammals are dominated by various species of squirrels, chipmunks, and shrews. Skunk, pika, and various rodents are also associated with this ecosystem. The more common smaller birds include woodpeckers and flycatchers, the rock wren, Western robin, mountain bluebird, and the gray-headed Junco.

The Subalpine regions of the Study Area are extremely limited. They can be characterized as having a very rugged terrain due to soils, topography, heavy snow accumulations and historic glacial action. Wet meadows may be common. The Englemann Spruce-Subalpine Fir Association occurs in this ecosystem as well as large areas of exposed rock. Plant and animal life is restricted due to the harsh environment and lack of habitat area.

Hydrology

Surface Waters

There are approximately 480 miles of surface streams and 62 lakes and reservoirs in the Study Area. Surface water systems consist of Utah Lake and its tributaries, Jordan River and tributaries, and Great Salt Lake and its tributaries, including the Jordan River.

Utah Lake is a shallow, freshwater lake 25 miles long and 11 miles wide with a surface area of approximately 150 square miles. Historical mean depths of 20 feet have been recorded, however, increased diversions of tributary flows and siltation have reduced the mean depth to approximately eight feet. The capacity of Utah Lake has been estimated to be 883,900 acre-feet and the principal water uses are irrigation and recreation.

Utah Lake is fed by two large rivers, the Provo River and Spanish Fork, and several smaller streams. The location of these feeder streams is shown in Figure II-14. The natural inflow to the Lake is approximately 500,000 acre-feet per year, half of which occurs during April, May, and June.

Currently four large interbasin transfers deliver an average of almost 160,000 acre-feet to the Utah Valley's supply, while a fifth extracts approximately 25,000 acre-feet annually. The Ontario Tunnel

FIGURE II-14

UTAH LAKE-JORDAN RIVER HYDROLOGIC BASINS

MAJOR SURFACE WATERS



by: NHPQ

diverts approximately 10,000 acre-feet/year of Silver Creek water to the upper reaches of the Provo River. This is supplemented by approximately 30,000 acre-feet/year from the Duchesne River and 50,000 acre-feet/year from the Weber-Provo Canal. Approximately 70,000 acre-feet/year are diverted from Strawberry Reservoir to Diamond Fork, a tributary of Spanish Fork.

Approximately half of the water that enters Utah Valley is supplied via the Provo River. The headwaters of the Provo River are located in the western part of the Uinta Mountains about 45 miles northeast of Provo. The River flows westward from the high mountain streams and lakes through the Kamas Valley and south into the lower Heber Valley where it is dammed, forming Deer Creek Reservoir, with a capacity of 152,570 acre-feet. Below the dam, the river flows southwestward, crossing the Wasatch Mountains through Provo Canyon to enter Utah Lake west of the City of Provo. The mean annual discharge of the Provo River is estimated to be 350,500 acre-feet/year (484 cfs).

The Spanish Fork Basin, the second largest source of water entering Utah Lake, lies southeast of Utah Valley. The Spanish Fork rises on the Wasatch Plateau, west of Soldier Summit, about thirty miles southeast of the City of Spanish Fork, and flows northwest to its confluence with Thistle Creek at Thistle. Continuing northwestward, the river traverses the Wasatch Range through Spanish Fork Canyon, entering Utah Lake four miles northwest of the City of Spanish Fork. The mean annual discharge of the Spanish Fork is 157,800 acre-feet/year (218 cfs).

Approximately half of the total annual inflow to Utah Lake is lost to evaporation. Flow from the Lake into the Jordan River is regulated except for high runoff years. During low lake stages, water is pumped from the Lake into the River.

From Utah Lake, the Jordan River meanders approximately 55 river miles northward to the Great Salt Lake. The river gradient is slight, averaging only 5.2 feet per mile, and flows are consequently slow moving. River flows are supplemented by many tributaries entering the river from the east and are depleted during the summer by diversions into irrigation canals. Major tributaries are illustrated in Figure III-14. Throughout most of its length, the river gains from groundwaters entering from springs and seeps and from agricultural irrigation return flows.

At the Jordan Narrows, where the Jordan River cuts through the Traverse Mountains 10 miles north of Utah Lake, the bulk of the river flow is diverted into irrigation canals. Flow immediately below the diversion varies from 1,400 cfs during the spring runoff to zero during the growing season. North of the diversion, the river meanders through a broad flood plain, gaining flow from the groundwater, irrigation return flows, several minor wastewater treatment plants, Corner Canyon Creek and Dry Creek. Southwest of Murray, the river passes through several areas of marshland.

North of Bennion the flood plain broadens and the course of the river becomes even more tortuous. The ten-mile reach of the river north of Bennion to the Salt Lake City Airport passes through the Salt Lake City metropolitan area and is the recipient of many

municipal and industrial waste discharges. At 21st Street South, the bulk of the river flow is again diverted, this time into the Surplus Canal. The purpose of the Surplus Canal is to provide a short, direct route to the Great Salt Lake for Jordan River flows in excess of those that can pass down the natural river channel without flooding. North of Salt Lake City, the river flows through wide expanses of salt marsh to reach the Great Salt Lake approximately seven miles northwest of the city limit.

The Great Salt Lake, a remnant of ancient Lake Bonneville, is the final repository for the waters of the Utah Lake and Jordan River Basins. The lake is a large, shallow and highly saline, closed water body which gains water mainly from streamflow from the mountains to the east and loses water by evaporation. It is the largest lake in the Western Hemisphere that does not drain to the ocean. In 1965, at a lake surface elevation of 4,194 feet, the surface area was about 1,000 square miles and the maximum measured depth was 27 feet.

The Great Salt Lake changes volume continuously in response to the difference between the volume of inflow and evaporation losses. The total load of salt in the lake is relatively constant; however, salt concentration obviously changes with changes in lake volume. Salt content during the last 50 years has generally remained within the range of 250 to 350 grams/litre.

The impact on surface water hydrology from several proposed state and other federal projects is discussed in Chapter VII.

Groundwater

Approximately 126,000 acre-feet of the groundwater supply are presently being utilized annually in the Salt Lake County-Jordan River Valley area. Of the total, 117,000 acre-feet are withdrawn from the confined aquifer. The remaining 9,000 acre-feet come from natural discharge from the shallow aquifer. About 55 percent of the 212,000 acre-feet annual recharge to the confined system is presently being withdrawn and used from wells and springs. The remaining 45 percent is being discharged naturally to the Jordan River, the Great Salt Lake, and to the shallow water table by upward leakage. Some of the discharge to the shallow water table finds its way into the Jordan River. The remainder is consumed by phreatophytes and lost through evapotranspiration.

In Utah County, about 73,000 acre-feet of groundwater are withdrawn by wells each year. Of this amount, 40,500 acre-feet/year are withdrawn from wells in northern Utah County, 21,000 acre-feet/year in southern Utah County, and 11,500 acre-feet/year from Goshen Valley. Only 500 acre-feet of the total are withdrawn from the unconfined aquifer. An additional 55,000 acre-feet are discharged to Utah Lake by springs within the Lake, by upward leakage into the Lake, and by some springs located at the edge of the Lake. Well discharge accounts for slightly over half of the recharge to the confined aquifer systems. Recharge and discharge are in equilibrium in north and south Utah Valleys but discharge exceeds recharge by about 7,600 acre-feet in the Goshen Valley.

In the Heber Valley area, groundwater is discharged from the unconsolidated deposits by pumping from wells, evapotranspiration, effluent seepage, and probably by subsurface outflow through the surrounding consolidated rocks. The total volume of water pumped from wells is very small, and because no drastic changes in irrigation practice have occurred, the long-term recharge-discharge regimen remains fairly stable.

In some sectors of the Study Area, additional groundwater could be developed. The volumes of present and additional development estimated for each area are summarized in Table II-3. Generally, in areas where additional development is assumed to be possible, recharge is in equilibrium with discharge. This means that well development would increase at the expense of natural discharge.

Water Quality

Information on existing water quality and water quality problem areas is couched in terms of specific parameter levels. To aid the reader in understanding the character of water quality in the Study Area, the presentation is prefaced by a discussion of the specific parameters.

Dissolved Oxygen

The concentration of Dissolved Oxygen (DO) can be considered one of the most significant elements in an aquatic ecosystem. The composition and productivity of the more desirable biological communities is a function of dissolved oxygen concentration. Simply, as DO levels decrease, more pollutant tolerant species predominate. As DO increases, the most desirable aquatic life forms, such as trout, dominate.

In the Study Area, all surface waters except Utah Lake and the Jordan River from Utah Lake to the Jordan Narrows are classified "CC," cold water fisheries. Utah Lake and the upstream segment of the Jordan River are classified "CW," warm water fisheries. Class CC requires a minimum DO concentration of 6.0 mg/l and Class CW requires at least 5.5 mg/l of DO.

Biochemical Oxygen Demand

The Biochemical Oxygen Demand (BOD) determination is used to assess the content of bacterially degradable organic material in an ecosystem. In general, the higher the BOD the greater the potential for pollution and oxygen depletion. High BOD values can also be linked to the health hazards of polluted waters. For these reasons, the State of Utah has established a maximum BOD concentration of 5.0 mg/l for all Class C waters in the State.

Total Coliforms

The coliform group of bacteria is found in human and animal excrement as well as on plants and in the soil. Although they are not considered to be disease-causing organisms, their presence in water in large numbers is considered to be an indicator of pollution and a public health hazard. The State of Utah Class C standard limits the concentration of total coliform bacteria to 5,000 per 100 ml.

TABLE 11-3

SUMMARY OF GROUNDWATER POTENTIAL

<u>Area</u>	<u>Estimated Recharge (ac-ft/year^{1/})</u>	<u>Present Well Discharge (ac-ft/year)</u>	<u>Surplus or Deficit (ac-ft/year)</u>	<u>Estimated Potential Increase (ac-ft/year)</u>
Salt Lake County	212,000	126,000 ^{2/}	86,000	50,000 ^{3/}
Utah County	138,000	72,500	65,500	15,000
Northern Juab County	Undetermined	15,000	Undetermined	None
Wasatch County-Heber Valley	86,000	Undetermined	Undetermined	Undetermined

1/ Recharge to principal aquifer system.

2/ Includes 19,000 acre-feet diverted from springs.

3/ Consists of 30,000 acre-feet quality water and 20,000 acre-feet low quality water.

Nutrients

A variety of nutrients are required to sustain a viable aquatic ecosystem. The relative abundance of various nutrients determines the character and productivity of the ecosystem. When one or more nutrients are introduced in abnormal amounts, usually because of man's intervention, system productivity may become unbalanced, leading to the proliferation of undesirable species.

Nitrogen and phosphorus often appear to be the limiting nutrients in an aquatic ecosystem and when present in excess, lead to uninhibited algal growth resulting in reduced light transmittance, aesthetic problems, and eventual decomposition and oxygen depletion.

The State of Utah has not defined specific standards for either nitrogen or phosphorus forms. However, the Water Quality Management Plan established nitrate levels in excess of 0.5 mg/l and phosphate levels in excess of 0.05 mg/l as nutrient enrichment problems.

Total nitrogen (TN) represents the sum of all nitrogen forms. Under normal conditions nitrogen is converted from one form to another but is rarely lost from an ecosystem, thus the TN value usually remains constant or increases with inputs.

Total Dissolved Solids

Total Dissolved Solids (TDS) are the non-filterable materials contained in water. As such, TDS content can be related to salinity or salt content of water. High TDS values can render a watercourse unuseable for agricultural use, aquatic habitat, or human consumption.

The State of Utah Class C water quality standard does not directly address TDS concentration. However, the standard does require that:

"Chemical standards shall be as prescribed for drinking water by 'Public Health Service Drinking Water Standards, 1962'."

These standards require a maximum TDS concentration of 500 mg/l.

Existing Water Quality

Water quality problems in the Study Area, within the context of the parameters discussed above, are illustrated in Figures II-15 through II-26. The reference symbols, < and >, refer to "less than" and "greater than," respectively.

Further detailed discussion of existing water quality problems in the Study Area can be found in Volume C-2000, "Definition of Existing Data Base for Water Quality," of the Study Task Report Series.

Davis County - Headwater streams draining the west slope of the Wasatch Mountains in Davis County are of high quality. As many of these streams flow through agricultural areas and then urban development, water quality deteriorates. In the lower reaches, most streams do not meet Class C standards.

Howard Slough does not meet the Class C standard for Total Coliforms and TDS as well as recommended levels for nitrates and phosphates. The same is true for Kays Creek which also violates the BOD standard.

FIGURE II-15

UTAH LAKE-JORDAN RIVER HYDROLOGIC BASINS

WATER QUALITY-DISSOLVED OXYGEN



by: NHPQ

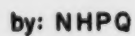
FIGURE II-16

UTAH LAKE-JORDAN RIVER HYDROLOGIC BASINS
WATER QUALITY-BOD



by: NHPQ

WATER QUALITY-TOTAL COLIFORMS



WATER QUALITY-NITRATES

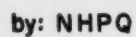


FIGURE II-19
UTAH LAKE-JORDAN RIVER HYDROLOGIC BASINS
WATER QUALITY-TOTAL PHOSPHATES



by: NHPQ

FIGURE II-20

UTAH LAKE-JORDAN RIVER HYDROLOGIC BASINS
WATER QUALITY-TOTAL DISSOLVED SOLIDS



by: NHPQ

FIGURE II-21
UTAH LAKE-WATER QUALITY
MEAN DISSOLVED OXYGEN

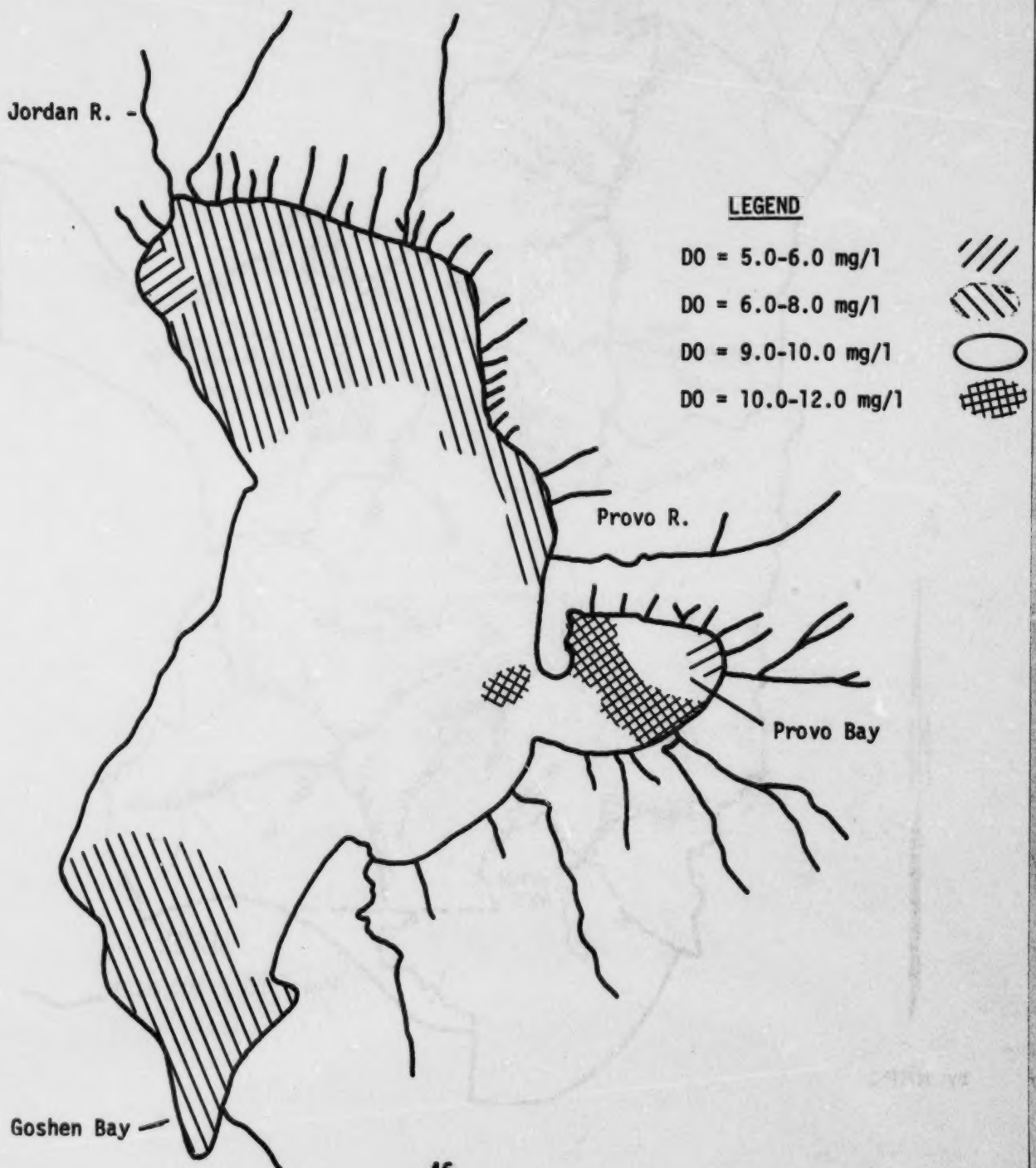


FIGURE II-22
UTAH LAKE-WATER QUALITY
MEAN BIOCHEMICAL OXYGEN
DEMAND

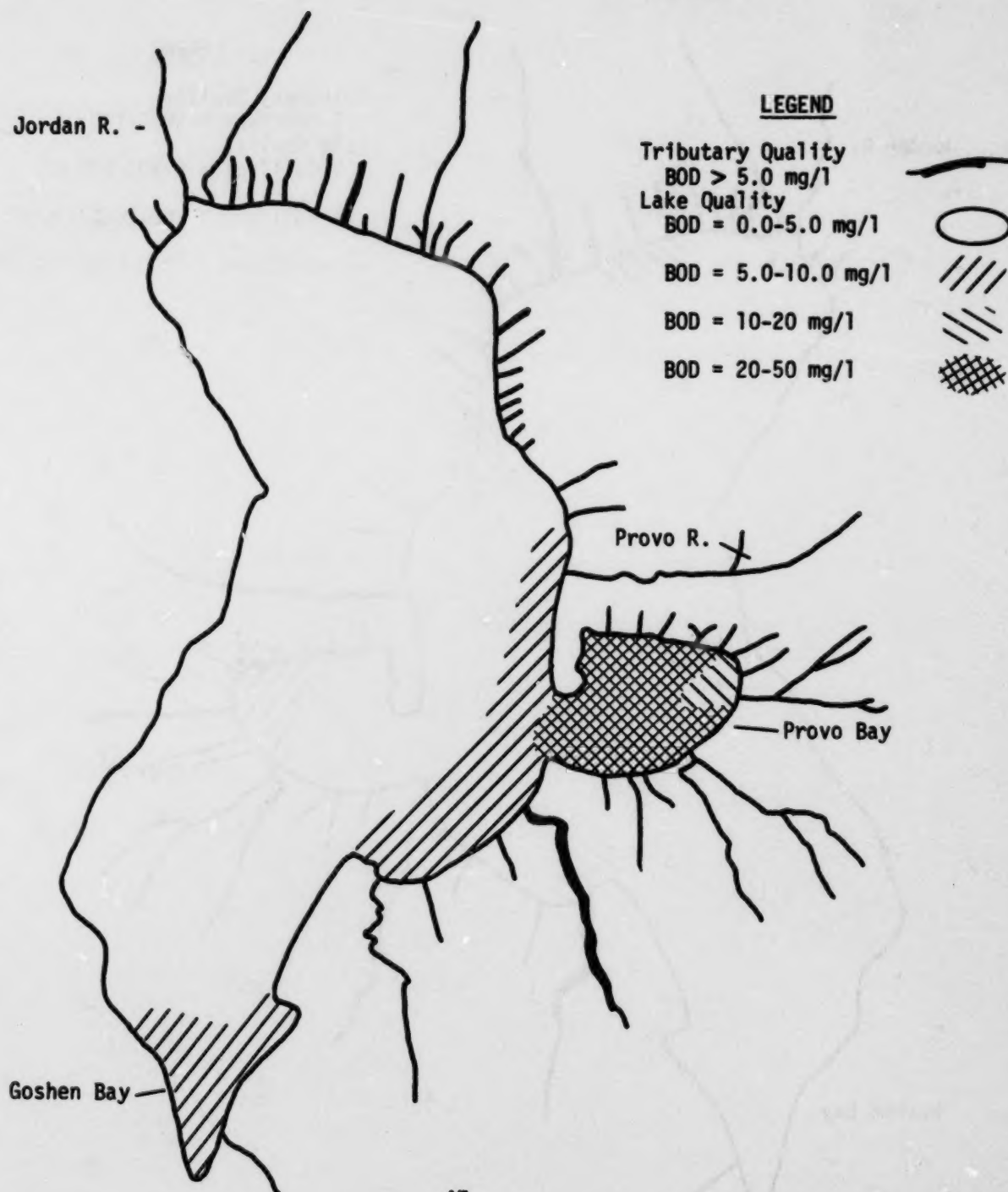


FIGURE II-23
UTAH LAKE-WATER QUALITY
MEAN TOTAL COLIFORM

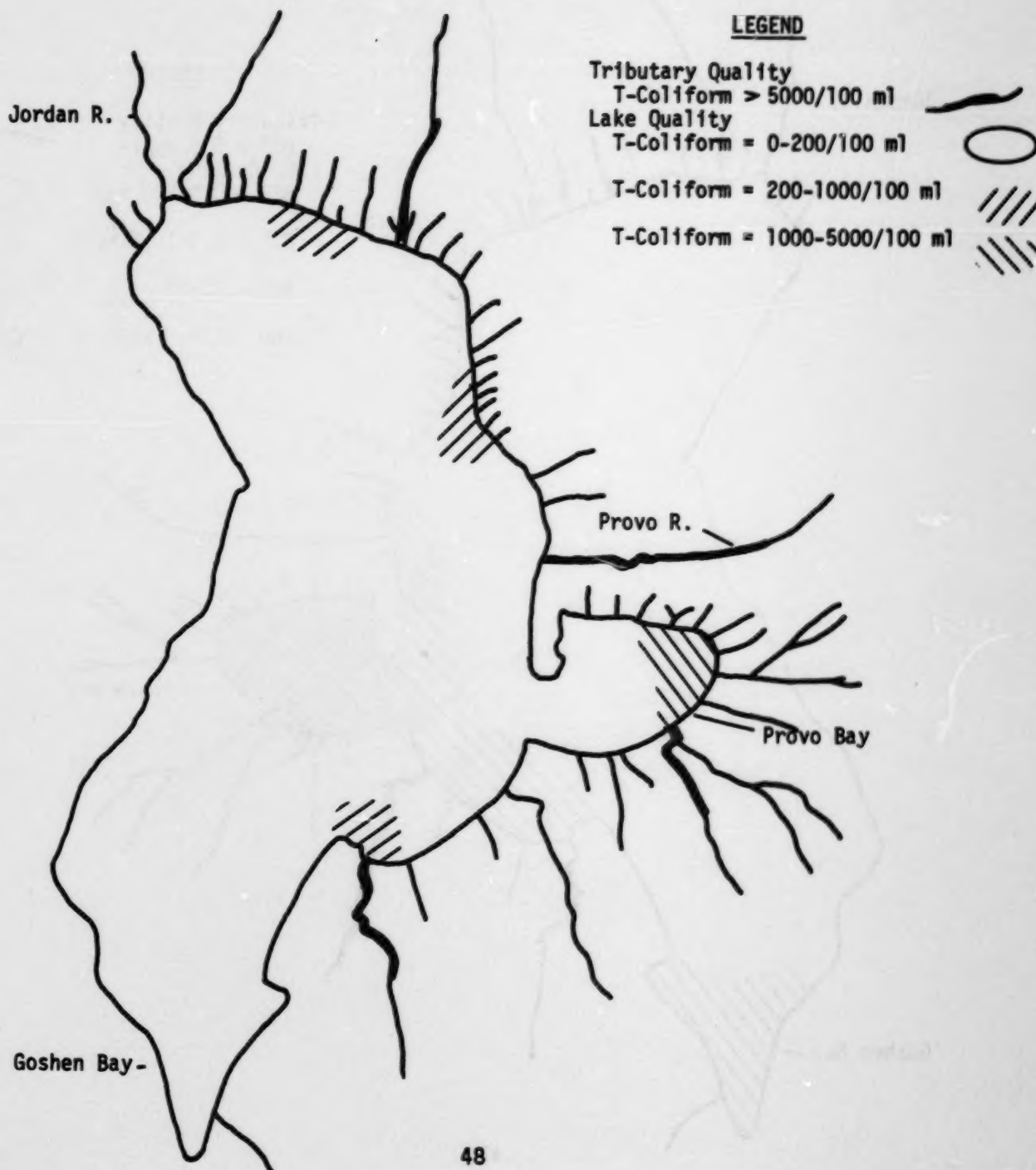


FIGURE II-24
UTAH LAKE-WATER QUALITY
MEAN NITRATE

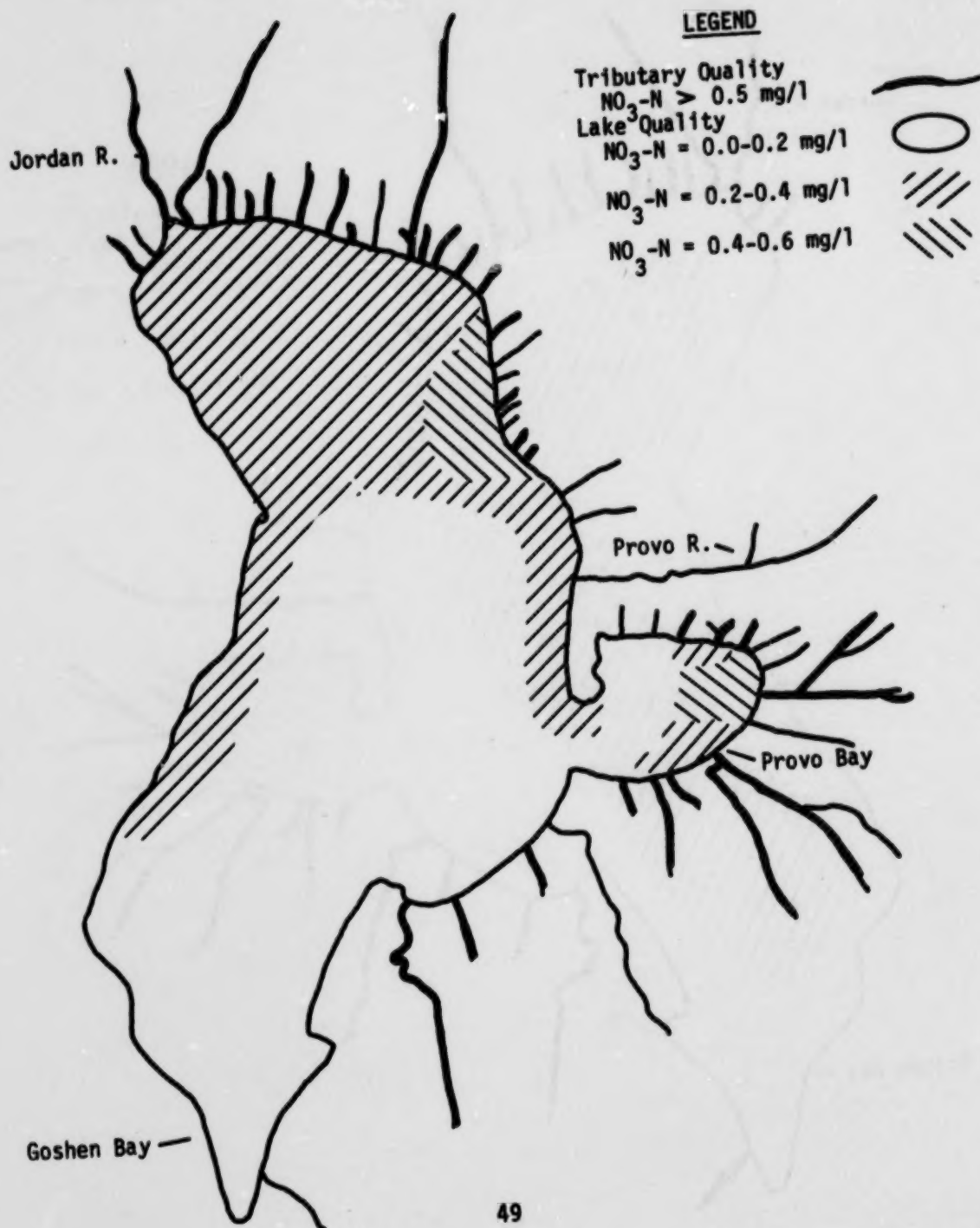


FIGURE II-25
UTAH LAKE-WATER QUALITY
MEAN TOTAL PHOSPHATE

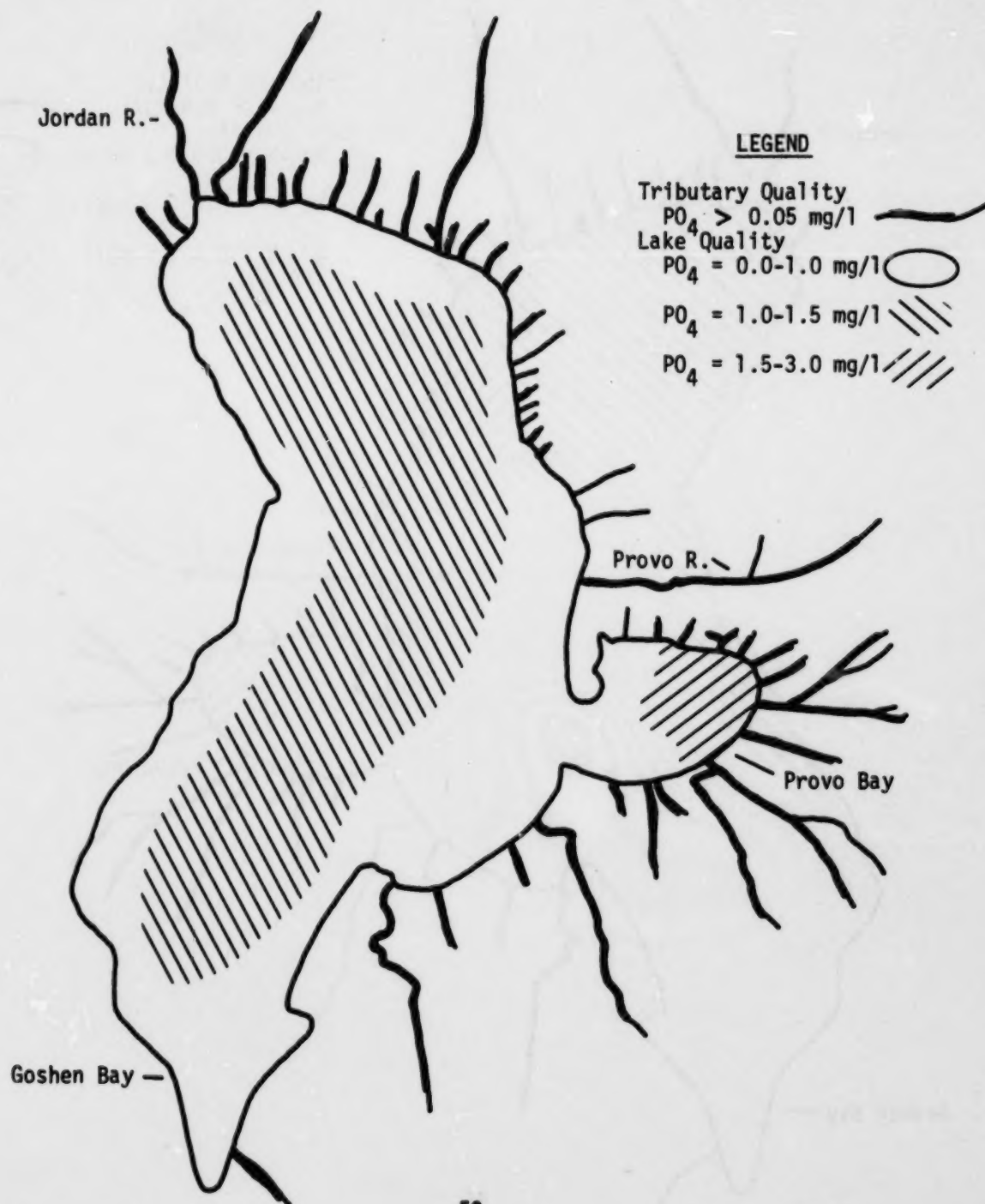
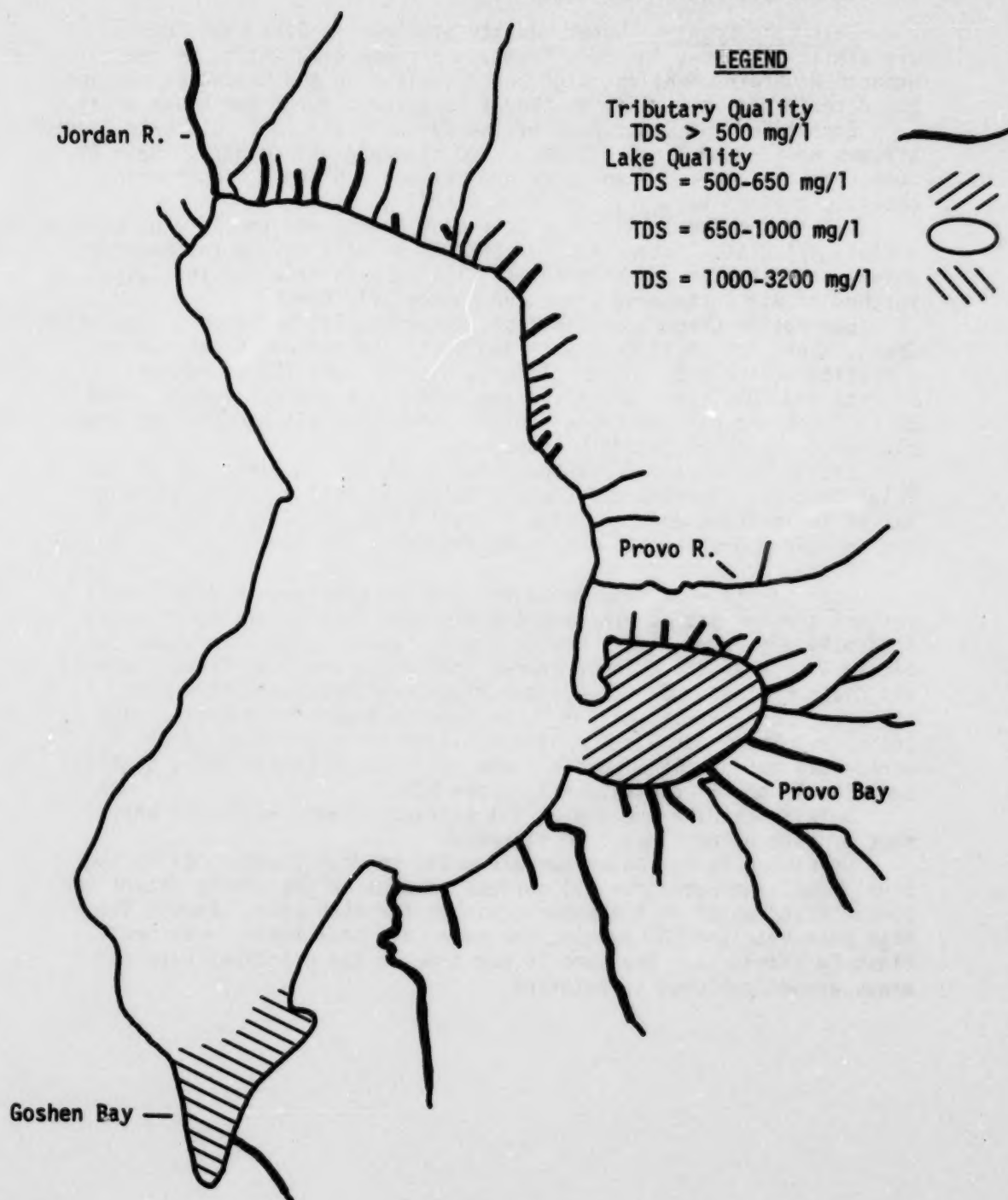


FIGURE II-26
UTAH LAKE-WATER QUALITY
MEAN TOTAL DISSOLVED SOLIDS



BOD standards are also violated in the lower reaches of Bear Creek, Farmington Creek, Ricks Creek, Barnard Creek, Stone Creek, and Mill Creek. Of these, the water quality in Bear Creek, Farmington Creek, Stone Creek, and Mill Creek is also in violation of Total Coliform and Nitrate levels. Phosphate levels are violated in Farmington and Stone Creeks and TDS levels are excessive in Stone and Mill Creeks.

Salt Lake County - Water quality problems in Salt Lake County are similar to those in Davis County. Streams originating in the Wasatch Mountains manifest high water quality in the headwater reaches but deteriorate in quality as they flow through rural and urban areas.

Except for the lower part of the Jordan River, all Salt Lake County streams meet or exceed the Class CC DO standard of 6.0 mg/l. Mean DO levels in the lower Jordan River are between 3.5 and 5.0 mg/l with observed minimum values as low as 2.5 mg/l.

All of the Jordan River in Salt Lake County and the Surplus Canal violate all Class C standards (except DO) as well as the recommended values for nitrates and phosphates. The same is true for the lower reaches of Big Cottonwood Creek and Butterfield Creek.

Emigration Creek also manifests water quality problems. Emigration Creek, above the confluence with Red Butte and Parleys Creek, is in violation of the BOD, Total Coliform, nitrate, and TDS standards. Nitrate and TDS levels are also excessive below the confluence. Red Butte Creek and Parleys Creek violate nitrate levels and Parleys Creek also violates Total Coliform standards.

Little Cottonwood Creek and Midas Creek are in violation of the Total Coliform standard for Class C waters as well as the recommended values for nitrate and phosphate. Mill Creek and City Creek manifest the identical problem and also have excessive TDS levels.

Utah County - Significant water quality problems in Utah County surface streams are apparent in the American Fork River, Beer Creek, Jordan River, Provo River, Hobbie Creek, Spanish Fork River, and the Tintic Mine Drainage. The American Fork River and Beer Creek violate all Class C standards. The Jordan River manifests excessive BOD, nitrates, phosphates, and TDS. The same is true of the Tintic Mine Drainage. The Provo River manifests large concentrations of all parameters except TDS. Hobbie Creek and Spanish Fork exhibit significant levels of all constituents except BOD.

Notwithstanding the above, all surface streams in Utah County meet or exceed the Class C DO standard.

Utah Lake is the major surface water in Utah County. It is the final receiving water for all surface streams in the County except the Jordan River which is the major drainage for Utah Lake. Except for high phosphate and TDS levels, the main Lake body meets or exceeds Class CW standards. The same is not true of the principal bays and areas around polluted tributaries.

Water in Provo Bay does not mix well with the remainder of Utah Lake. As a result of this and significant tributary drainage, sections of Provo Bay do not meet Class CW standards. DO levels between 5.0 and 6.0 mg/l have been measured in the far eastern end of Provo Bay. BOD levels in most of the Bay are between 20 and 50 mg/l. The eastern end of the Bay also manifests high nitrate and phosphate levels. In contrast to the remainder of the Lake, Provo Bay exhibits the lowest TDS concentrations, 500 to 650 mg/l.

Goshen Bay exhibits water quality problems similar to Provo Bay. BOD levels are between 5.0 to 10.0 mg/l in Goshen Bay. However, because of the lack of significant tributary flow and underlying salt flats, Goshen Bay has extremely high TDS concentrations, ranging from 1,000 to 3,200 mg/l.

Wasatch County - Although water quality problems are limited in Wasatch County, the use of surface waters for water supply magnify the concern for the quality of these waters. The most significant problem seems to be excessive nutrient levels in streams entering Deer Creek Reservoir, such as Spring Creek, Daniels Creek, Center Creek, Lake Creek, and Snake Creek as well as the upper Provo River and its tributaries. These inputs also serve to increase nitrate and phosphate levels below Deer Creek Reservoir. Decker Creek and Spring Creek also manifest Total Coliform standards in excess of Class C water.

Air Quality

Information on existing air quality and air quality problem areas is presented in terms of two of the numerous possible air pollutants, carbon monoxide (CO) and total suspended particulates (TSP) because they are pollutants that have recognized health effects, can be modelled with some accuracy, and are closely related to urban activity and growth.

Sources which emit air pollutants in general and CO and TSP in particular can be classified as point, line, and area sources as described below.

- . Point sources: These are large single stack emitters such as power plants, steel mills, etc., which emit more than 12 tons/year of a pollutant.
- . Line sources: These are major roads carrying large volumes of automotive traffic along which individual vehicles move thereby creating lines of pollutant emissions.
- . Area sources: These are made up of many emitters not large enough to be classified as points or lines. They are averaged over a small geographic area. Typically they include residential area space heating and traffic on streets not classified as line sources.

To aid the reader in understanding the character of air quality in the Study Area, the presentation of existing air quality is prefaced by a discussion of these two air pollutants.

Carbon Monoxide (CO)

Motor vehicle traffic along heavily traveled highways is usually the predominant source of urban air pollution. The major pollutants emitted from motor vehicles are carbon monoxide (CO), hydrocarbons (HC), and oxides of nitrogen (NO_x). The last two react photochemically in the formation of smog according to the relative concentrations of various air pollutants and the occurrence of certain meteorological conditions, particularly sunlight. The incomplete combustion of carbonaceous fuels produces carbon monoxide (CO), and the automobile is the primary source of this gas in an urban environment. Carbon monoxide is a relatively stable gas and does not appreciably take part in the photochemical process; however, CO is a poisonous inhalant. No other toxic gaseous air pollutant is found at such relatively high concentrations in urban atmospheres. It is dangerous because it has a strong affinity for hemoglobin, which carries oxygen to body tissues.

Because CO is relatively chemically stable, comes mostly from motor vehicles, and can be measured easily in the atmosphere, the concentration of CO represents a good basis for air quality analysis. Additionally, CO is closely related to urban activity and growth making it a good indicator of the impact of land use plans.

Reductions in CO concentrations are required by the Utah State Implementation Plan for air quality attainment and maintenance. EPA standards for CO are couched in terms of primary and secondary standards. The primary standard is designed to protect human welfare, thus it refers to possible damage to plants, animals, and materials. These CO standards are:

<u>Averaging Time</u>	<u>Primary Standard</u>		<u>Secondary Standard</u>	
	<u>ug/m³</u>	<u>ppm</u>	<u>ug/m³</u>	<u>ppm</u>
1 hour	40,000	35	40,000	35
8 hour	10,000	9	10,000	9

These standards represent values not to be exceeded more than once per year.

Total Suspended Particulates (TSP)

Total suspended particulates (TSP) are a significant indicator of air quality because of their toxic effects on human beings and animals as well as their corrosive effects on many materials and the reduction in visibility and aesthetics in areas of high concentration. Respiratory illnesses have a pronounced association with particulate concentrations, and adverse health effects have been noted for annual geometric mean levels of as little as 80 micrograms per cubic meter (ug/m³). Historically, several communities in the Study Area are above or near this level. Particulates also are important in health considerations because they interact with other pollutants, particularly SO₂. They act as nucleation sites in the atmosphere for forming sulfuric acid mist and they increase respiratory problems associated with SO₂.

Like CO, TSP concentrations are indicators of urban activity and growth and, as such, EPA has set the primary and secondary TSP standards presented below:

<u>Averaging Time</u>	<u>Primary Standard ug/m³</u>	<u>Secondary Standard ug/m³</u>
24 hour	260	150
1 year	75	60

The 24 hour average values are not to be exceeded more than once per year while the one year standard represents a geometric mean not to be exceeded.

Other Related Air Quality Factors

For a complete understanding of the character of air quality in the Study Area, it is important to have some perception of the factors, other than pollutant concentrations and standards, which affect air quality. Principle among these factors are the topography and meteorology of the Study Area and the types of pollutant sources.

Topographical Factors - Based on an analysis of historical air quality data, topographical maps, and field review, it can be concluded that the Study Area can be divided into two separate air basins, each having different and distinct characteristics. These regions are the Salt Lake City basin and the Provo basin, with the dividing line being the Traverse Mountains (see Figure II-5).

The Salt Lake City basin is relatively flat but with the terrain generally sloping toward the Great Salt Lake. The primary metropolitan area in the basin is Salt Lake City which is at the eastern edge against the Wasatch Mountains. It has a population of about 190,000 and is at an altitude of approximately 4,250 feet above sea level. The surrounding mountains form barriers to wider dispersal of air pollutants and they influence wind, weather, and climate in the basin, which are important in establishing its air quality.

The Provo basin is also relatively flat and slopes toward Utah Lake. The City of Provo, which is the main metropolitan area in the basin, is at the eastern side against the Wasatch Mountains from which canyons enter into the basin. The metropolitan area has a population of about 65,000 and is at an altitude of approximately 4,550 feet above sea level. In most important respects this basin is like and behaves similar to the Salt Lake City basin. Conclusions about effects of topography on air pollution in the Provo basin are essentially like those of the Salt Lake City basin.

Meteorological Factors - Of considerable importance to the problem of air pollution in the Salt Lake City basin is the fact that anti-cyclonic systems are frequent during Fall and Winter causing stagnant

high pressure to persist for days or weeks. Strong inversion conditions result from this system and related cooling of the earth's surface. These strong inversions and relatively low wind speeds cause unfavorable conditions for air quality.

Inversions occur approximately 80 percent of mornings in the Salt Lake City basin especially during Fall and Winter. From March through October the air tends to be stable during the night and unstable during daytime. From November through February persistent inversions tend to exist. Wind directions are not generally constant over the region for periods of hours or a day.

Meteorological features in the Provo basin are similar to those of the Salt Lake City basin. They are altered in detail only by the slight differences in altitude and topography between the two basins.

Source Factors - Each of the three types of sources, point, line, and area sources, emit CO. The greatest contribution is from mobile sources, particularly automobiles. In the Salt Lake City air basin, approximately 92 percent of all carbon monoxide emissions come from line sources, approximately 3 percent from point sources, and about 5 percent from area sources. In the Provo air basin, point sources are more important, accounting for about 15 percent of all emissions, with line sources accounting for about 80 percent, and area sources about 5 percent of emissions. As noted previously, area sources include traffic on streets not classified as line sources, so automotive emissions are even more dominant than might appear from these statistics.

Total suspended particulate matter (TSP) is emitted by a variety of sources in the Study Area. Particulate emissions originating from line sources include exhaust emissions, emissions from tire wear, fugitive dust from unpaved roads, emissions resulting from highway construction, and emissions resulting from the use of sanding for ice and snow control. Over 10,000 line sources were included in the source inventory, with each segment of highway in the area being treated as a composite source.

Particulate emissions from point sources include emissions from space heating and industrial processes. Smelters, steel mills, power plants, refineries, and asphalt batch plants are primary sources of particulate emissions in the Study Area.

Particulate emissions from area sources arise from space heating of homes and commercial facilities; fugitive dust from agricultural operations; emissions from local vehicle traffic; and fugitive dust from residential, industrial, and commercial construction activities.

Under this system of classification, about 26 percent of TSP emissions come from line sources, about 48 percent from point sources, and about 26 percent from area sources.

Existing Air Quality

Monitored air quality data for CO and TSP are available from 13 stations operated by the Utah State Division of Health. The locations of these monitoring stations are illustrated in Figures II-27 and II-28. Six of these stations are located in the Salt Lake City air basin, and seven stations monitor air quality in the Provo basin.



FIGURE II-27
AIR POLLUTANT MONITORING STATIONS
SALT LAKE CITY

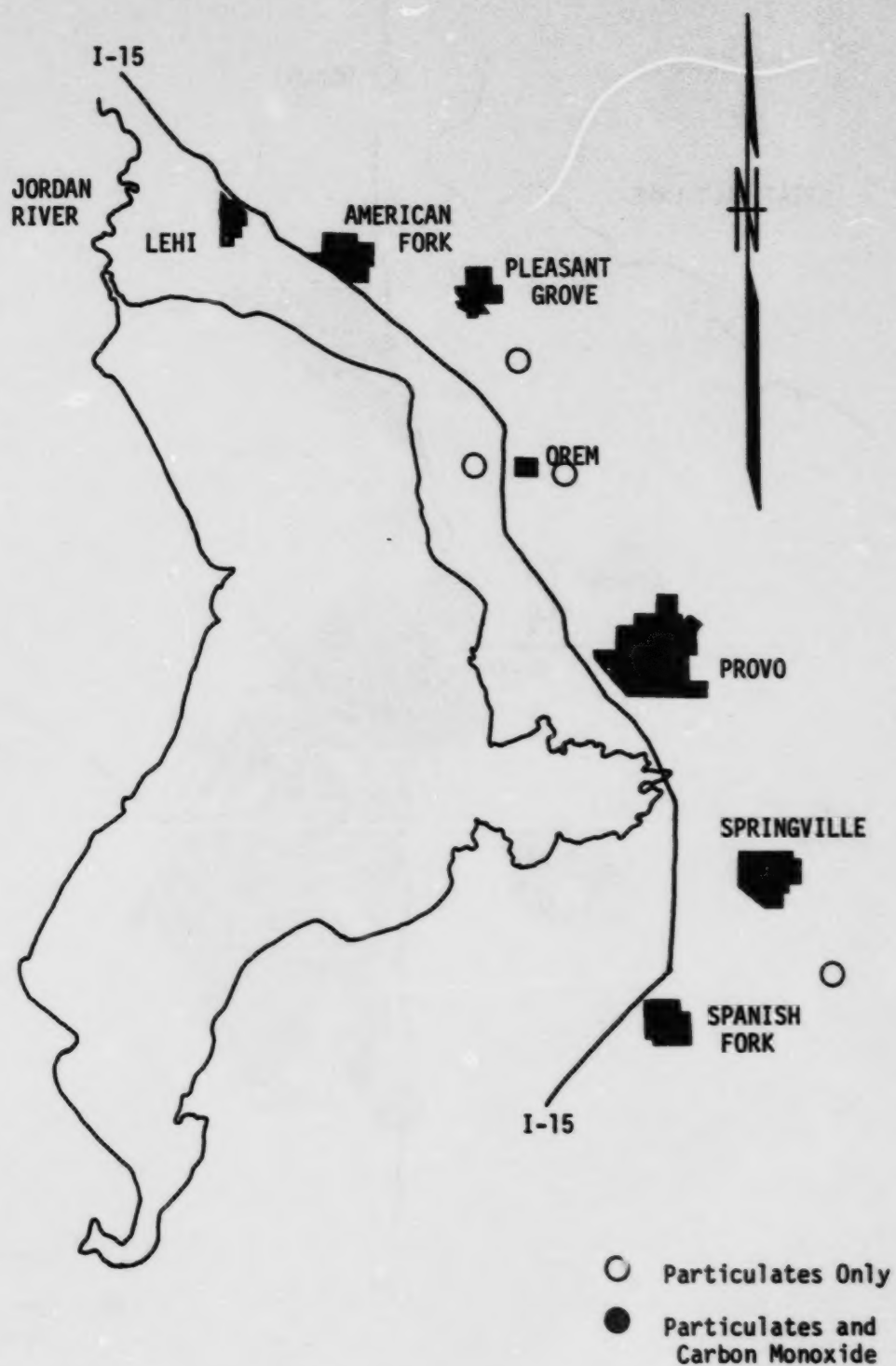


FIGURE II-28
AIR POLLUTANT MONITORING STATIONS
PROVO

All 13 stations are used to obtain daily averages of particulate concentrations in units of micrograms per cubic meter. High-volume air samplers are employed to collect fairly large quantities of particulate matter on filters. The total weight of particulate matter deposited each day is determined gravimetrically following EPA standard methods. Records of particulate concentrations extend at least back through 1974 for all stations.

Carbon monoxide concentration data are available from five stations in the two air basins. Data from these stations are reported in terms of hourly concentrations expressed as parts of pollutant per million parts of air (ppm).

Salt Lake City Basin - Significant historic carbon monoxide (CO) concentration data in the Salt Lake City basin are available only at the Salt Lake City station (Figure II-27). The Bountiful station had recorded CO data for two months. Maximum and second maximum (value exceeded only once/year) 1-hour and 8-hour CO concentrations for the period of record (1970-1974) are illustrated in Figure II-29. It appears from the data presented in Figure II-29 that decreases in maximum CO concentrations are being realized in Salt Lake City since 1972. The 1-hour second maximum primary standard of 35 ppm has been achieved since 1972, but the 8-hour second maximum primary standard of 9 ppm is still being violated. The second maximum one hour CO concentration for 1974 was 34 ppm which was recorded on January 11, 1974, at 9:00 A.M. The second maximum eight hour CO average for 1974 was 13 ppm which was recorded on January 11, 1974, at 10:00 A.M.

Historic, total suspended particulate (TSP) concentrations are available for six monitoring stations in the Salt Lake City basin; however, data for the Ogden sampling site is not included in this discussion because it is outside the Study Area. TSP values at the five remaining sites for 1974, including the measured geometric mean, the 24 hour maximum average, and the 24 hour second maximum average (value exceeded only once per year), are presented in Table II-4. In comparing the actual annual geometric mean values with the primary EPA standard of 75 micrograms per cubic meter ($\mu\text{g}/\text{m}^3$) only Kearns and Bountiful stations have acceptable annual average particulate concentrations. Considering the secondary standard of 60 $\mu\text{g}/\text{m}^3$, it is apparent that again only the Kearns and Bountiful stations are below the annual average standard. All the stations have recorded TSP concentrations above the primary and secondary 24 hour standards of 260 $\mu\text{g}/\text{m}^3$ and 150 $\mu\text{g}/\text{m}^3$, respectively, for both the maximum 24 hour average and for the second maximum 24 hour average.

Historic annual average TSP concentrations in the Salt Lake City basin for the period 1940 through 1971 are illustrated in Figure II-30. This historic data base reflects decreasing TSP concentrations at the Salt Lake City monitoring station but with annual geometric mean values still above the primary standard of 75 $\mu\text{g}/\text{m}^3$. In contrast, data from the Kearns and Magna sites manifest a reasonably constant historic annual TSP average concentration below the primary standard.

FIGURE II-29

AVERAGE HOURLY MAXIMUM
CARBON MONOXIDE

SALT LAKE CITY AIR BASIN

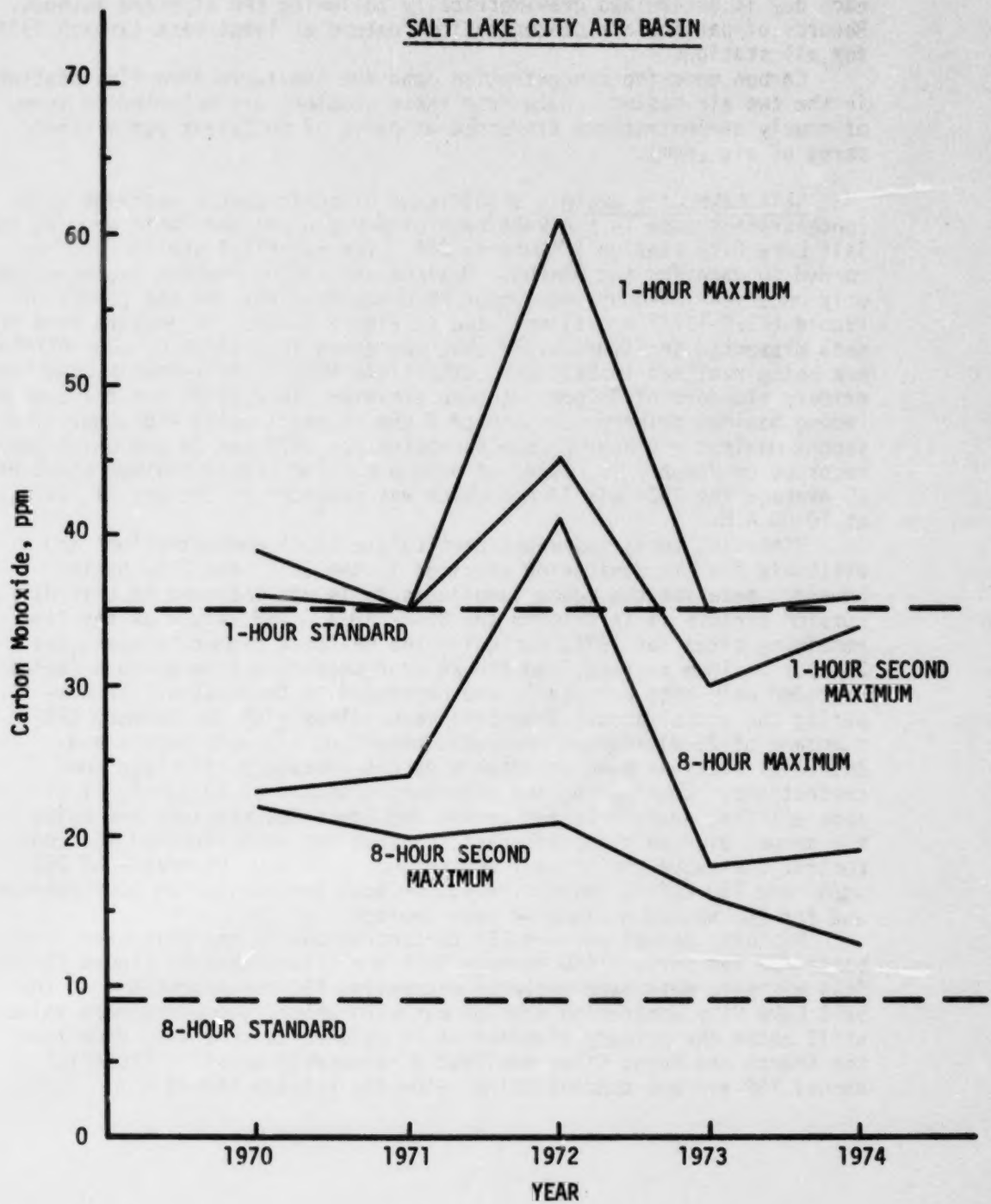
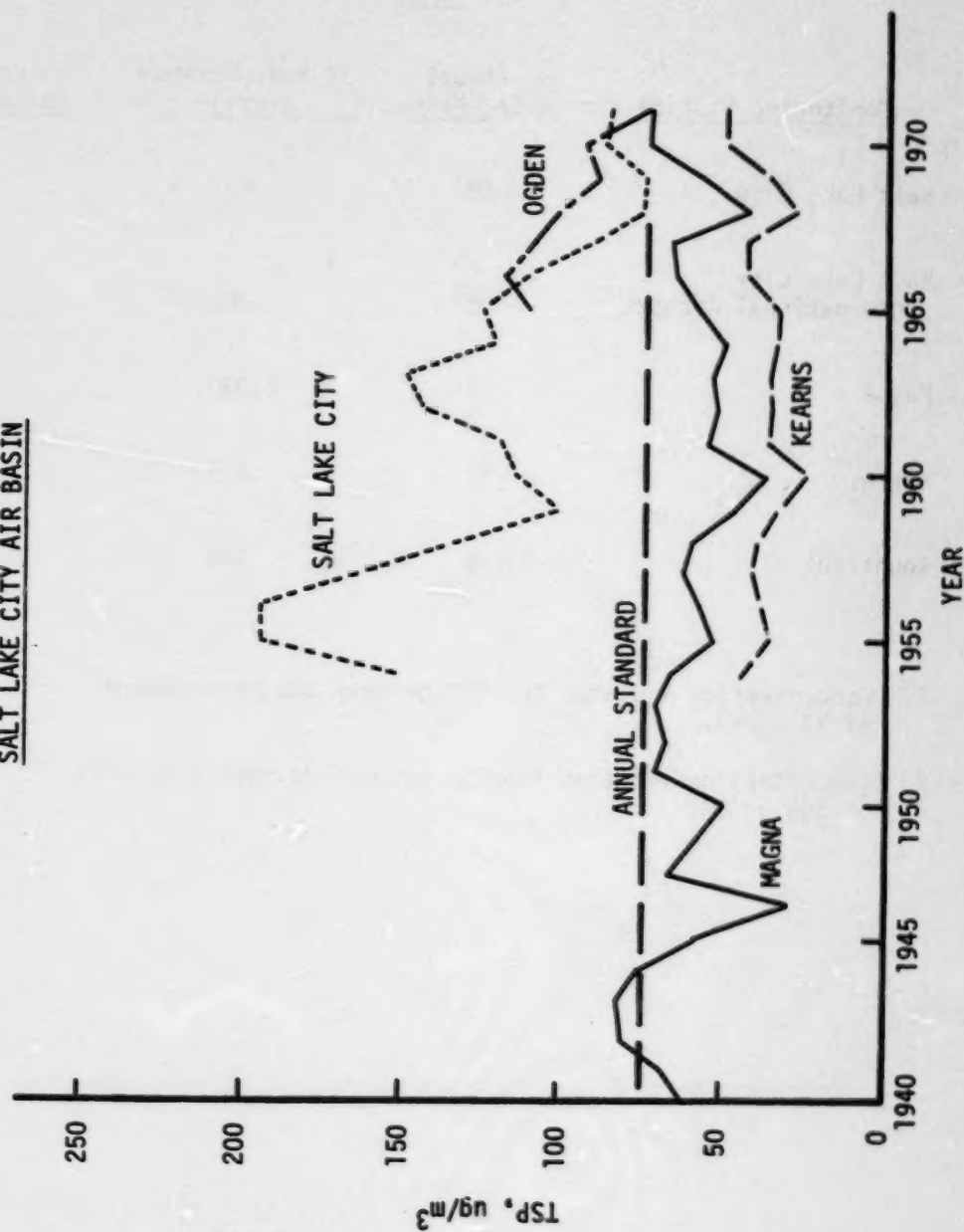


TABLE II-4
PARTICULATE CONCENTRATIONS IN THE SALT LAKE
CITY BASIN (ug/m³)
1974

<u>Monitoring Station</u>	<u>Annual Geo Mean</u>	<u>24-Hour Maximum Average</u>	<u>24-Hour Second Maximum Average</u>
Salt Lake City	83 ¹	637	542 ²
Salt Lake City International Airport	76 ¹	702	456 ²
Magna	75	2,990	550 ²
Kearns	52	475	424 ²
Bountiful	49	476	---

1. Concentration violates the TSP primary annual standard of 75 ug/m³.
2. Concentration violates the TSP primary 24-hour standard of 260 ug/m³.

FIGURE II-30
ANNUAL AVERAGE TOTAL SUSPENDED PARTICULATES
SALT LAKE CITY AIR BASIN



Provo Basin - Carbon monoxide (CO) concentrations are available at only one station in the Provo basin, in downtown Provo (see Figure II-28). Historic CO concentrations at this site are illustrated in Figure II-31. Although the 1-hour maximum CO values have decreased between 1971 and 1973 and then increased slightly, the 1-hour second maximum CO concentrations have been below the primary standard of 35 ppm. Maximum and second maximum 8-hour CO concentrations reflect trends similar to the 1-hour values, but all of these 8-hour CO concentrations are above the primary standard of 9 ppm.

In 1974 the recorded maximum one-hour average of 30 ppm occurred on November 12, 1974 at 10:00 P.M. The second maximum one hour average in 1974 also was 30 ppm and was recorded on September 26, 1974 at 11:00 P.M. and October 18, 1974 at 9:00 A.M. The maximum eight hour average in 1974 was 18 ppm, recorded on November 13, 1974 at 3:00 A.M. The second maximum eight hour average in 1974 was 15 ppm and was recorded on September 27, 1974 at 2:00 A.M. and November 15, 1974 at 4:00 A.M.

Historic total suspended particulate (TSP) concentrations in the Provo basin are available for seven monitoring stations. TSP values at these sites for 1974 including the measured geometric mean, the 24-hour maximum average, and the 24-hour second maximum average (value exceeded only once per year) are presented in Table II-5. From the data in Table II-5, it is apparent that only the Provo site violates the primary annual average standard of 75 $\mu\text{g}/\text{m}^3$. With respect to the secondary annual average standard of 60 $\mu\text{g}/\text{m}^3$, Mapleton and Lehi are below it, and all other sites have recorded values above it.

All sites, except Orem, are in violation of the primary 24-hour standard of 260 $\mu\text{g}/\text{m}^3$ and all sites violate the secondary 24-hour standard for 150 $\mu\text{g}/\text{m}^3$.

Historic TSP records at Provo are available for 1972-1974 and for 1973-1974 for all other sites. These data are insufficient for establishing trends, but do not reflect any great variations at each site for the period of record.

Utah State Implementation Plan

The Air Quality Control Plan of the State of Utah establishes three air quality control regions (AQCR). One of these, the Wasatch Front AQCR, contains most of the Study Area, including all of the region for which model computations were made (see Chapter VI). Both carbon monoxide and total suspended particulates are classified as Priority I pollutants for the Wasatch Front AQCR, and a control strategy was established to achieve national secondary standards for particulates within three years after approval of the plan, and to attain national ambient air quality standards for carbon monoxide by 1977. Essential elements of these strategies are summarized below.

Carbon Monoxide (CO) - The State Implementation Plan (SIP) carbon-monoxide control strategy centers upon emissions from automobiles and

FIGURE II-31

AVERAGE HOURLY MAXIMUMS
CARBON MONOXIDE

PROVO AIR BASIN

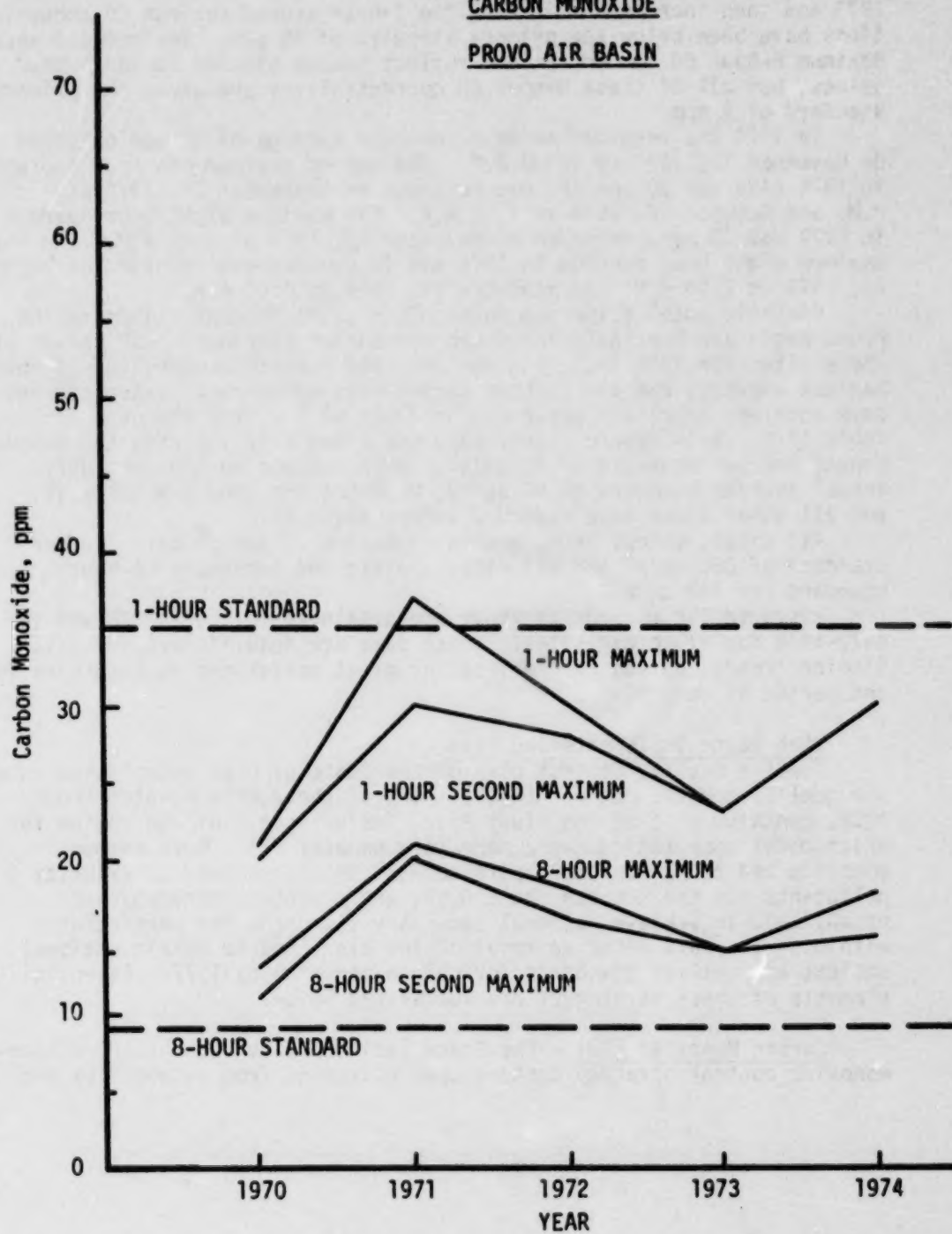


TABLE II-5
PARTICULATE CONCENTRATIONS IN THE
PROVO BASIN (ug/m³)
1974

<u>Monitoring Site</u>	<u>Annual Geo Mean</u>	<u>24-Hour Maximum Average</u>	<u>24-Hour Second Maximum Average</u>
Provo	78 ¹	625	565 ²
Geneva	64	396	340 ²
Lehi	58	386	271 ²
Pleasant Grove	61	554	409 ²
Lindon	68	466	442 ²
Orem	70	226	202
Mapleton	44	441	305 ²

1. Concentration violates the TSP primary annual standard of 75 ug/m³.
2. Concentration violates the TSP primary 24-hour standard of 260 ug/m³.

light trucks, which reportedly account for approximately 96 percent of all CO emissions in Salt Lake County in 1970. The Initial Control Strategy includes: (1) enforcement of regulations pertaining to Notice of Construction, Open Burning, Visible Emissions, and Automobile Emission Control Devices; (2) enforcement of compliance with any pertinent future regulations; and (3) a public relations campaign designed to result in proper tuning of automobiles, widespread use of car pools or mass transit, and decreased use of automobiles. A supplemental control strategy provides for an annual inspection and maintenance program, a proposed intake manifold air-bleed device retrofit for pre-1968 model light-duty vehicles, and several detailed traffic control measures for both Salt Lake City and Provo (including continuous attention to mass transit improvements in both locations). The projected combined impact of these measures for Salt Lake County is presented in Table II-6.

Total Suspended Particulates (TSP) - The SIP control strategy for man-made particulates is built around a finding that particulate emissions from industrial processes and electric power generation accounted for approximately 90 percent of all particulate emissions in Utah County in 1970, and about 80 percent of the particulate emissions throughout the State. Thus, the strategy involves enforcement of standards related to emissions from stationary sources. Automotive vehicles, solid waste, and space heating are not considered applicable as subjects for emission reduction.

The control strategy includes enforcement of Code of Air Conservation Regulation: pertaining to Notice of Construction, Open Burning, Visible Emissions, and Particulate Emissions. The strategy also includes enforcement of the applicable requirements of the Federal Standards of Performance for New Stationary Sources.

Expected results of the control strategy for Utah County, which contains the monitoring station (USDH-AQS Provo) manifesting the State's highest annual geometric mean TSP concentration in 1970, are presented in Table II-7. A background concentration of 20 micrograms per cubic meter was used for development of the strategy, and proportional models were used to demonstrate the adequacy of the control strategy.

One difficulty with the SIP is that only the emissions from point sources are controlled. Although these emissions represent a proportion of "man made" emissions in Utah County, they exclude important sources of TSP which contribute heavily to ambient concentrations throughout the Study Area. Because of the lack of precise data for individual point sources, the effect that the SIP controls will have on ambient concentrations could not be predicted in this EIS. The problem and its implications are discussed in Chapter IX.

TABLE II-6
CARBON MONOXIDE EMISSIONS ESTIMATES
AND PROJECTION-TONS PER YEAR
SALT LAKE COUNTY

<u>Emissions Sources</u> <u>Category</u>	<u>Calendar Year</u>			
	<u>1970</u>	<u>1975</u>	<u>1977</u>	<u>1980</u>
Autos & Light Trucks	217,278	158,613	117,330	67,356
Other Transportation	6,604	7,979	8,520	9,313
Solid Waste	1,249	1,350	1,393	1,453
Space Heating	767	828	854	890
Industrial Processes	152	172	192	208
Electric Power Generation	<u>60</u>	<u>64</u>	<u>64</u>	<u>65</u>
Total CO Emissions	226,110	169,006	128,353	79,285
% Reduction from 1970		25%	43%	65%

TABLE II-7
PARTICULATE EMISSIONS ESTIMATES
AND PROJECTIONS - TONS PER YEAR
UTAH COUNTY

Emissions Sources Category		Calendar Year			
		1970	1975	1977	1980
Non-Applicable	Autos & Light Trucks	239	309	309	309
	Other Transportation	220	265	283	309
	Solid Waste	124	134	138	144
	Space Heating	393	425	439	457
	Subtotal (Non-Applicable)	976	1,133	1,169	1,219
Applicable	Space Heating	287	233	240	250
	Industrial Processes (Includes fuel combustion)	7,682	4,451	4,591	4,818
	Electric Power Gen.	886	298	310	328
	Subtotal (Applicable)	8,855	4,982	5,141	5,396
	Total Particulate Emissions	9,831	6,151	6,310	6,615
	% Reduction from 1970		37%	36%	33%

CHAPTER III

PROJECT ALTERNATIVES

LAND USE BASIS

Projected land use and population comprise the traditional data base for the development of water quality management alternatives. Available land use projections and population forecasts for various sectors of the Study Area were used in the development of the Utah Lake-Jordan River Basin Plan. Details of this information base are given in the Plan.

In order to facilitate the presentation of this data and the evaluation of environmental impacts, the Study Area was divided into sub-areas or planning areas as illustrated in Figure III-1. The following discussion relates to these planning areas.

Population

Study Area population is presented in Table III-1. The total 1970 population in the Study Area is reported to be 726,488 persons. The most significant portion of this population is in the Salt Lake City and South Salt Lake Areas which have 24.1 percent and 20.3 percent of the total Study Area 1970 population, respectively. Other densely populated areas include the North Davis Area with 8.1 percent of the 1970 Study Area population, the Murray-Cottonwood Area with 10.3 percent of the 1970 Study Area population, and the Provo Area with 8.2 percent of the 1970 Study Area population.

The projected 1995 Study Area population is estimated to be 1,304,557 persons. In general, the more populated areas of the Study Area are expected to develop with population spreading outward into the suburbs and close-in rural areas. The most significant population growth areas are expected to be the North Davis Area, the Central Davis Area, the Murray-Cottonwood Area, and the Tri-Community/Sandy Area. These areas are expected to realize 1995 populations of 118 percent, 241 percent, 130 percent, and 126 percent over 1970 populations, respectively. Slow growth areas include the Salt Lake City (39 percent population growth), the Lake Mountains (15 percent), and Goshen/Nephi Area (25 percent).

Land Use

Generalized existing land use is illustrated in Figure III-2 and future land use in Figure III-3. The growth potential within the two basins is illustrated by comparing the Figures. Existing development is centered in the Salt Lake and Utah Valleys and is surrounded by agriculture. Pockets of industrial development serve the urban areas. Greater recreational use of the canyons is also projected.

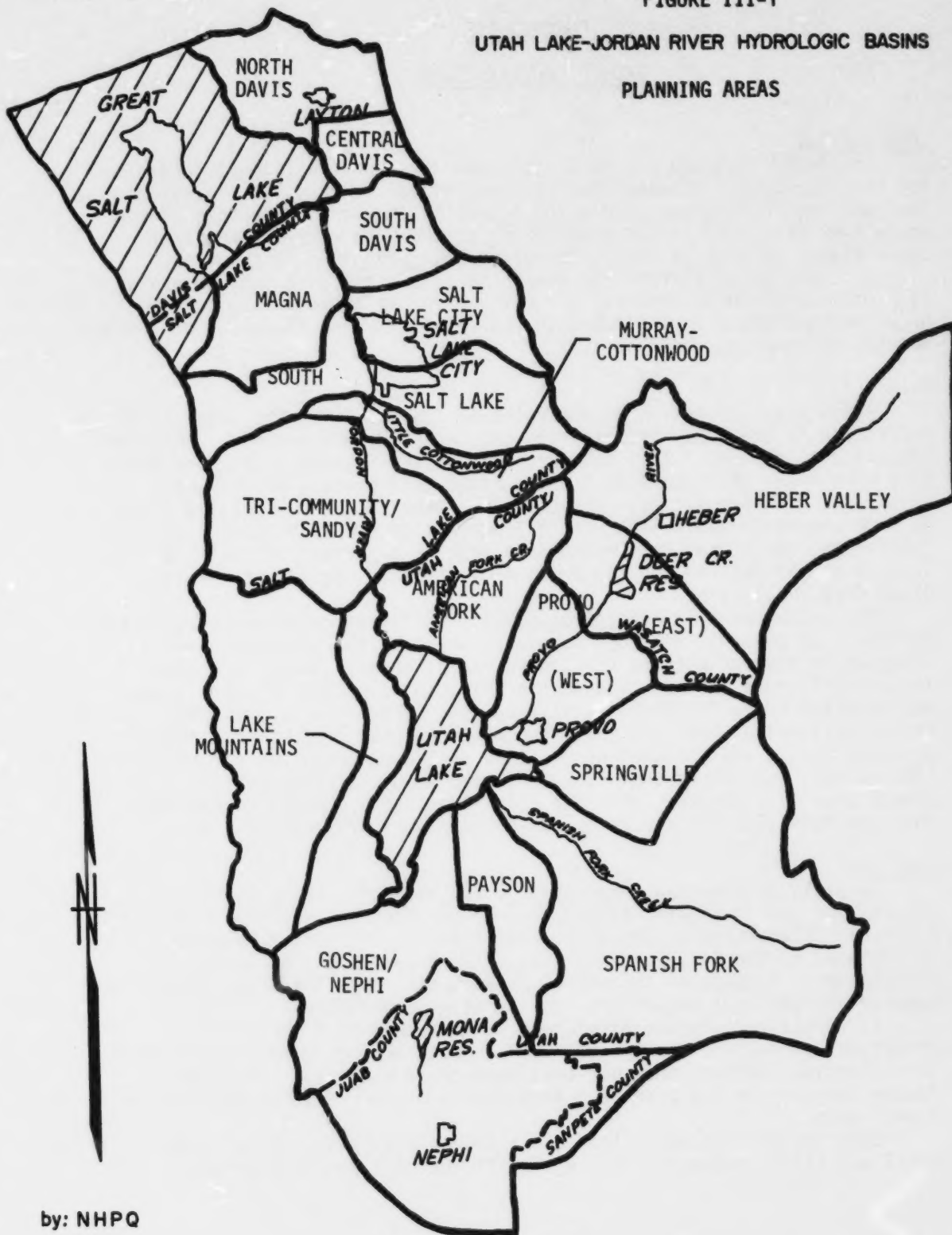
As forecasted, future development will spread in a north-south direction, connecting the two basins. Industrial development will expand concurrently. Perhaps the most environmentally significant aspect of future land use is the predicted development of canyon lands for recreational uses.

Existing and projected land use acreages are presented in Tables III-2 and III-3, respectively. A significant portion (68.6 percent)

FIGURE III-1

UTAH LAKE-JORDAN RIVER HYDROLOGIC BASINS

PLANNING AREAS



by: NHPQ

TABLE III-1
EXISTING AND PROJECTED POPULATION

<u>Planning Area</u>	<u>Population</u>	
	<u>1970</u>	<u>1995</u>
North Davis Area	58,632	127,800
Central Davis Area	9,518	32,500
South Davis Area	45,234	80,700
Magna Area	9,992	18,500
Salt Lake City	174,870	242,356
South Salt Lake Area	147,287	260,062
Murray-Cottonwood Area	74,816	172,207
Tri-Community/Sandy Area	51,642	116,882
American Fork Area	53,370	100,646
Heber Valley Area	5,863	9,820
Lake Mountains Area	295	340
Provo Area	59,826	86,415
Springville Area	12,160	21,730
Spanish Fork Area	9,001	14,752
Payson Area	8,120	12,536
Goshen/Nephi Area	<u>5,862</u>	<u>7,311</u>
TOTAL	726,488	1,304,557

FIGURE III-2

UTAH LAKE-JORDAN RIVER HYDROLOGIC BASINS

GENERALIZED EXISTING LAND USE



by: NHPQ

- Urban Residential
- Industrial
- Mountain Recreation
- Forest / Woodland
- Agriculture

FIGURE III-3

UTAH LAKE-JORDAN RIVER HYDROLOGIC BASINS

GENERALIZED FUTURE LAND USE



by: NHPQ

-  Urban Residential
-  Industrial
-  Mountain Recreation
-  Mountain Agriculture
-  Agriculture

TABLE III-2

EXISTING LAND USES

Planning Area	Total Land Area (Acres)	Urban Land Area (Acres)	Agricultural Land Irrigated (Acres)	Non-Irr. (Acres)	Vacant Land Area (Acres)	Range and Woodland Area (Acres)
North Davis Area	87,545	12,443	15,900	16,970	9,144	33,088
Central Davis Area	40,466	2,633	8,400	0	4,564	24,869
South Davis Area	62,069	5,480	12,100	0	11,283	33,206
Magna Area	73,701	12,245	1,900	5,425	26,564	27,567
Salt Lake City Area	97,304	22,695	1,200	0	18,922	54,487
South Salt Lake Area	128,323	18,878	11,000	4,744	9,152	84,549
Murray-Cottonwood Area	42,959	10,518	6,000	2,658	9,365	14,418
Tri-Community/Sandy Area	147,313	9,886	31,800	3,879	12,328	89,420
American Fork Area	135,806	12,022	34,300	7,993	20,644	60,847
Heber Valley Area	329,426	906	24,100	0	708	303,712
Lake Mountains Area	89,835	0	900	0	0	88,935
Provo Area	78,122	6,183	9,500	0	3,947	58,492
Springville Area	99,900	2,682	5,800	7,555	4,488	79,375
Spanish Fork/Payson Area	443,418	5,618	55,100	0	7,031	375,669
Goshen/Nephi Area	349,418	1,068	24,900	90,100	48,891	184,459
TOTAL	2,205,605	123,257	242,900	139,324	187,031	1,513,093

TABLE III-3

1995 LAND USES

Planning Area	Total Land Area (Acres)	Urban Land Area (Acres)	Agricultural Land Irrigated (Acres)	Non-Irr. (Acres)	Vacant Land Area (Acres)	Range and Woodland Area (Acres)
North Davis Area	87,545	17,844	10,000	18,870	7,743	33,088
Central Davis Area	40,466	4,549	4,900	2,233	3,915	24,869
South Davis Area	62,069	8,769	7,400	0	12,694	33,206
Magna Area	73,701	13,992	1,500	4,700	25,942	27,567
Salt Lake City Area	97,304	25,854	800	0	16,163	54,487
South Salt Lake Area	128,323	33,763	6,300	2,311	1,400	84,549
Murray-Cottonwood Area	42,959	19,194	3,400	167	5,780	14,418
Tri-Community/Sandy Area	147,313	17,487	25,300	4,322	10,784	89,420
American Fork Area	135,806	16,655	31,500	6,978	19,826	60,847
Heber Valley Area	329,426	1,196	23,600	210	708	303,712
Lake Mountains Area	89,835	-	780	0	-	89,055
Provo Area	78,122	7,758	8,700	0	3,172	58,492
Springville Area	99,900	4,182	5,400	6,878	4,065	79,375
Spanish Fork/Payson Area	443,418	6,639	49,000	0	12,110	375,669
Goshen/Neph1 Area	349,418	1,068	22,900	92,100	48,891	184,459
TOTAL	2,205,605	178,950	201,480	138,769	173,193	1,513,213

of the Study Area is currently covered with forests and woodlands. By comparison, urban development currently occupies only 5.6 percent of the total land area. The agricultural base of the Study Area is also evident with 17.3 percent of the land area in agriculture.

The Murray-Cottonwood Area is the most densely urbanized area with 24.5 percent of the land currently devoted to urban development. The Heber Valley Area and Goshen/Nephi Area are the least urbanized, 0.3 percent. Agricultural activity is greatest in the American Fork Area, Spanish Fork/Payson Area, and Goshen/Nephi Area.

The amount of Study Area land in forest and woodland is not expected to change significantly by 1995. Urban development is anticipated to increase to 8.1 percent of the total land area at the expense of agriculture and vacant land. By 1995, urbanization is expected to be centered in the North Davis Area, Salt Lake City Area, South Salt Lake Area, and Murray-Cottonwood Area with 20.4 percent, 26.6 percent, 26.3 percent, and 44.7 percent of total land devoted to future urban development, respectively. The Heber Valley Area and Goshen/Nephi Area will remain the least urbanized areas of the Study Area, 0.4 percent and 0.3 percent, respectively.

PLAN ALTERNATIVES

The development of physical system alternatives in the Plan was based on treatment levels as presented in Table III-4 and the following:

- . publicly owned treatment facilities must receive secondary treatment by 1977 and best practicable treatment by 1983.
- . Utah's interim effluent standards require a maximum of 10 mg/l BOD and 10 mg/l TSS in municipal wastewater effluents by 1980.
- . minimum treatment requirements in 1980 will be Level III, but certain situations may require Level IV.
- . economies of scale and efficiencies of design/operation can be achieved through regionalization or consolidation.
- . alternatives include consideration of alternative treatment levels, varying degrees of consolidation, and relocation of discharges.
- . the Study Area was divided into sub-areas and facility options developed for each sub-area.

Municipal Wastewater Management Alternatives - Davis County (DC)

Municipal wastewater management in Davis County is currently accomplished through four treatment plants: North Davis, Central Davis, South Davis North, and South Davis South. Future alternative wastewater management schemes are presented in Table III-5 and illustrated in Figure III-4.

A wide range of alternatives were considered. Expanding and upgrading all four facilities was the main theme of Alternatives 1 and 2. This plus constructing lake discharges at the North and Central Davis facilities was considered in Alternatives 3 and 4. Abandonment of the Central Davis facility and conveyance of wastewater to the North Davis facility was deliberated in Alternatives 5 and 6. Alternatives 7 and 8 focused on abandonment of the South Davis South facility and wastewater conveyance to the South Davis North plant while Alternatives 10 and 11 require conveyance to the Salt Lake City plant. Abandonment of both of the South

TABLE III-4
TREATMENT LEVELS AND ESTIMATED EFFLUENT QUALITY

PARAMETER	TREATMENT LEVEL			
	I	II	III	IV
SUSPENDED SOLIDS, MG/L	35	20	10	5
TURBIDITY, JTU	20	15	10	5
GREASE & OIL, MG/L	12	8	2	1
BOD ₅ , MG/L	25	20	10	5
COD, MG/L	100	75	50	20
NITROGEN, MG/L	30	30	30	30
PHOSPHORUS, MG/L	8	8	6	5
COLIFORM, MPN/100 ML	240	23	2.2	2.2
TOXICANTS				
SURVIVAL, %	33	40	80	90
TL _M , %	80	90	100+	100+
TOXICITY CONC., TU	1.25	1.1	0.8	0.6

TABLE III-5

MUNICIPAL WASTEWATER MANAGEMENT ALTERNATIVES - DAVIS COUNTY

<u>Alternative</u>	<u>Treatment Facility</u>	<u>Treatment Level</u> <u>III</u>	<u>Treatment Level</u> <u>IV</u>	<u>Discharge to</u> <u>Great Salt Lake</u>	<u>Abandon/Connect To</u>
DC-1	North Davis Central Davis South Davis North South Davis South		X X X X		
DC-2	North Davis Central Davis South Davis North South Davis South	X X X X			
DC-3	North Davis Central Davis South Davis North South Davis South	X X	X X	X X	
DC-4	North Davis Central Davis South Davis North South Davis South	X X X X		X X	
DC-5	North Davis Central Davis South Davis North South Davis South	X		X	North Davis
DC-6	North Davis Central Davis South Davis North South Davis South	X		X	North Davis

TABLE III-5 (Continued)
MUNICIPAL WASTEWATER MANAGEMENT ALTERNATIVES - DAVIS COUNTY

<u>Alternative</u>	<u>Treatment Facility</u>	<u>Treatment Level</u> <u>III</u> <u>IV</u>	<u>Discharge to</u> <u>Great Salt Lake</u>	<u>Abandon/Connect To</u>
DC-7	North Davis	X	X	
	Central Davis	X	X	
	South Davis North			→ South Davis North
	South Davis South	X		
DC-8	North Davis	X	X	
	Central Davis	X	X	
	South Davis North			→ South Davis North
	South Davis South	X		
DC-9	North Davis	X	X	
	Central Davis	X	X	
	South Davis North			→ Central Davis
	South Davis South			→ Central Davis
DC-10	North Davis	X	X	
	Central Davis	X	X	
	South Davis North			→ Salt Lake City (IV)
	South Davis South	X		
DC-11	North Davis	X	X	
	Central Davis	X	X	
	South Davis North			→ Salt Lake City (III)
	South Davis South	X		
DC-12	North Davis	X	X	
	Central Davis	X	X	
	South Davis North			→ Salt Lake City (IV)
	South Davis South			→ Salt Lake City (IV)

TABLE III-5 (Continued)

MUNICIPAL WASTEWATER MANAGEMENT ALTERNATIVES - DAVIS COUNTY

<u>Alternative</u>	<u>Treatment Facility</u>	<u>Treatment Level</u> <u>III</u>	<u>Discharge to</u> <u>Great Salt Lake</u>	<u>Abandon/Connect To</u>
DC-13	North Davis	X		
	Central Davis	X	X	
	South Davis North	X	X	
	South Davis South			
(A) Recommended Plan	North Davis	X		Salt Lake City (III)
	Central Davis	X		Salt Lake City (III)
	South Davis North	X		
	South Davis South	X		
(B) Recommended Plan	North Davis	X		
	Central Davis	X		
	South Davis North	X		
	South Davis South			

FIGURE III-4
WASTEWATER TREATMENT ALTERNATIVES - DAVIS COUNTY



FIGURE III-4 (Continued)
WASTEWATER TREATMENT ALTERNATIVES - DAVIS COUNTY

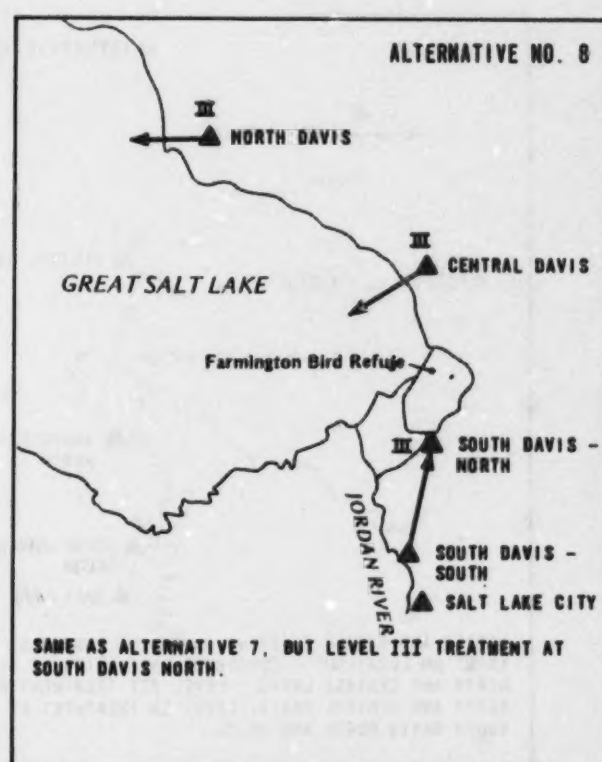
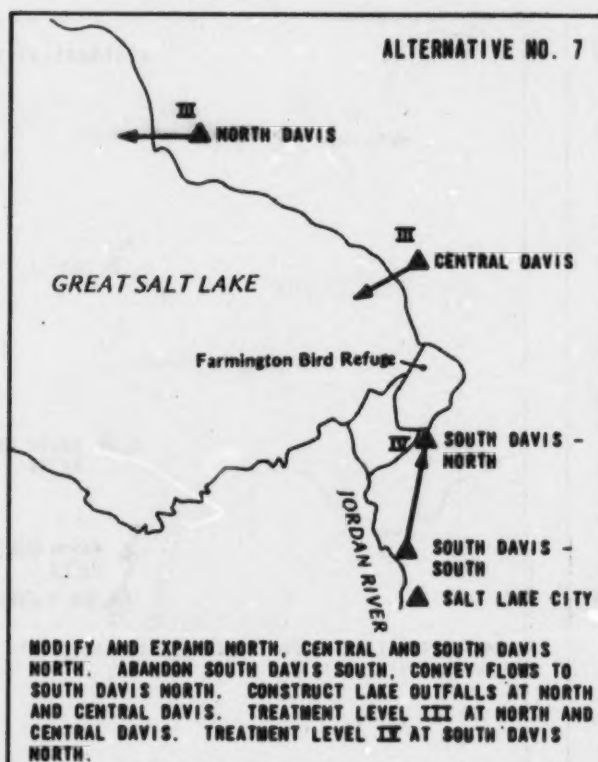
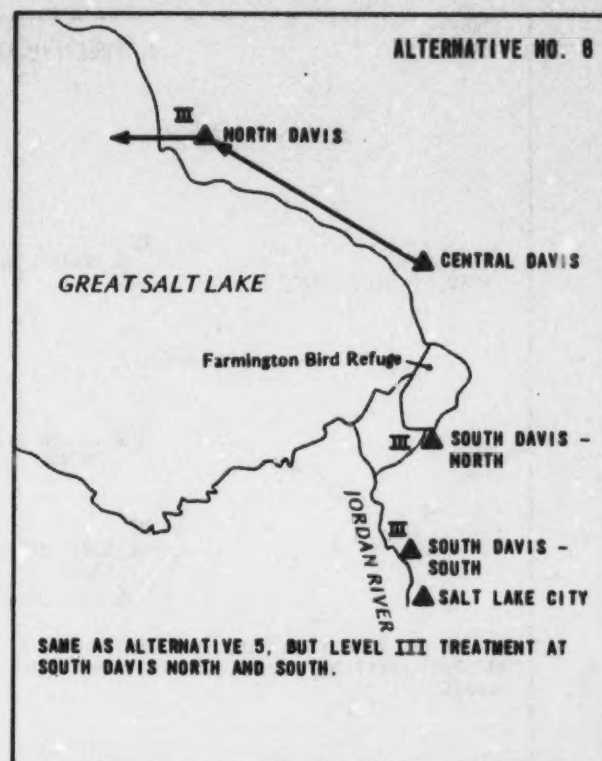
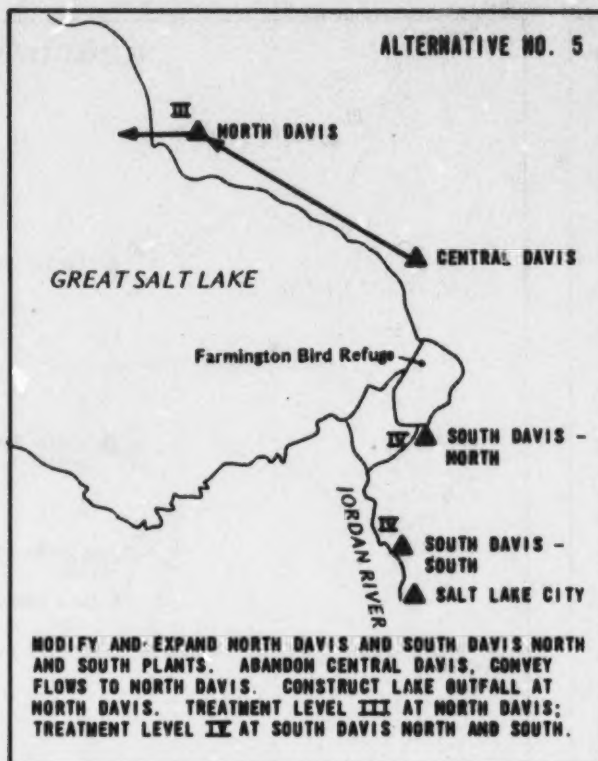


FIGURE III-4 (Continued)

WASTEWATER TREATMENT ALTERNATIVES - DAVIS COUNTY

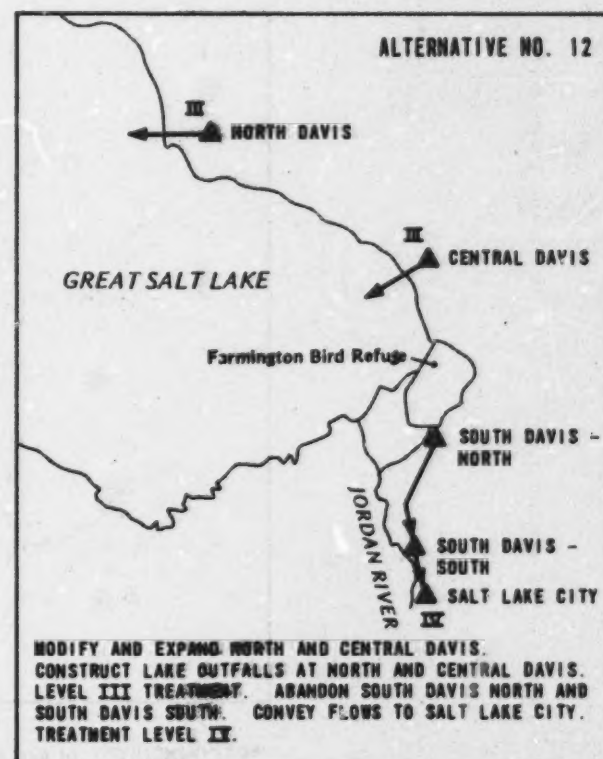
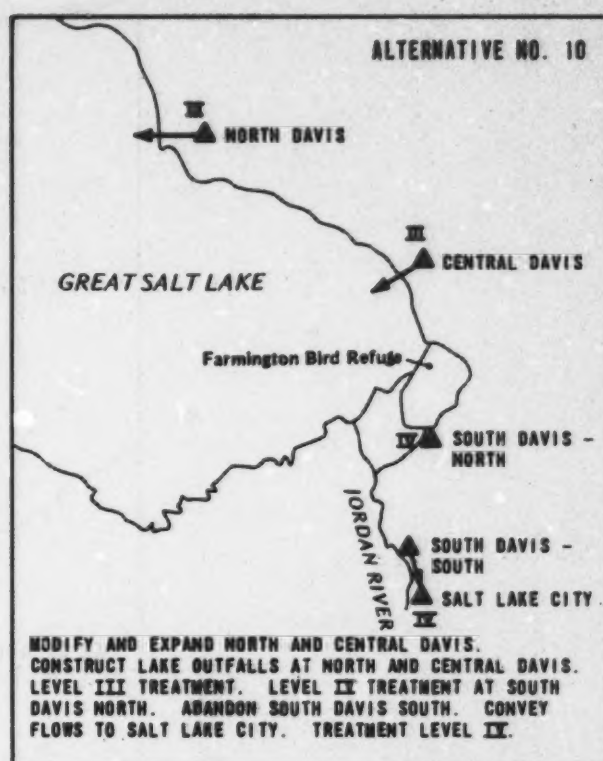
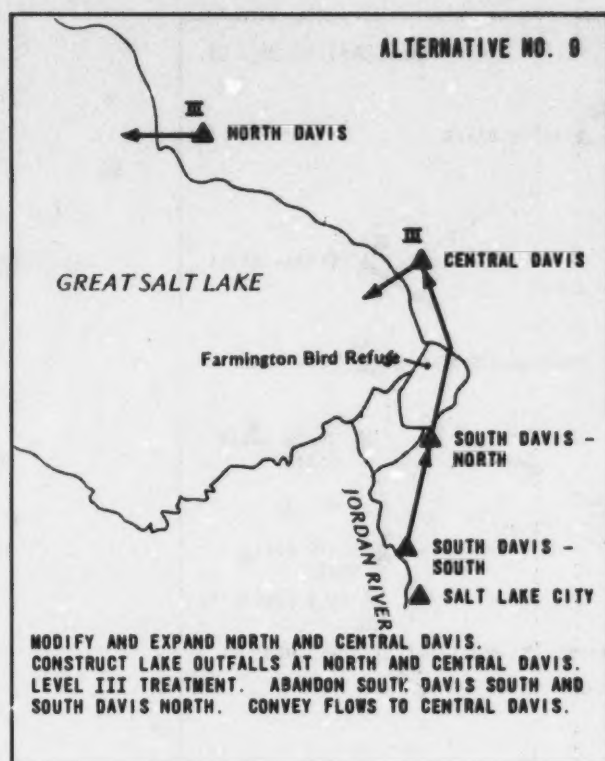
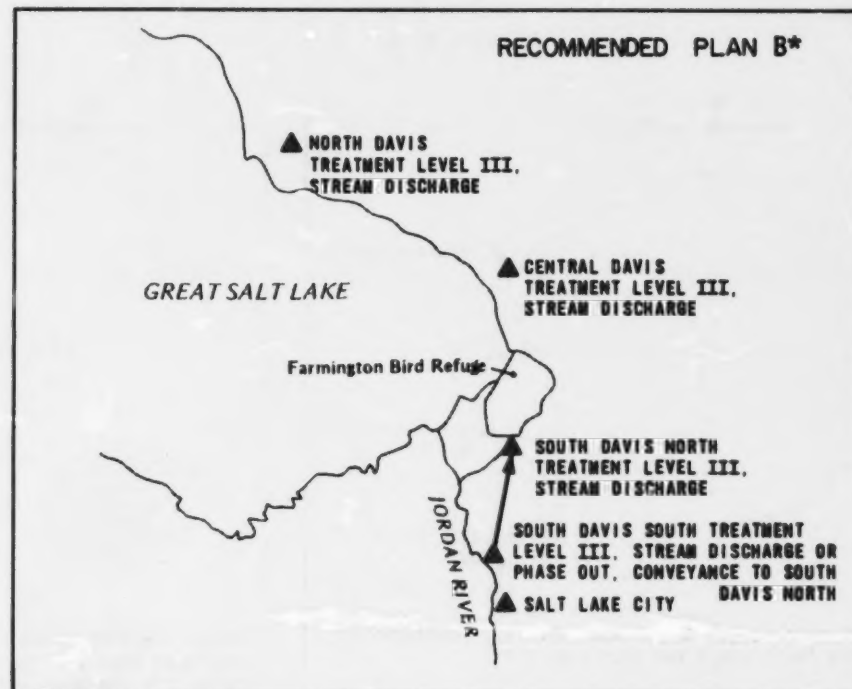


FIGURE III-4 (Continued)

WASTEWATER TREATMENT ALTERNATIVES - DAVIS COUNTY



*RECOMMENDED PLAN A IS SHOWN AS ALTERNATIVE DC-2

Davis facilities was considered in Alternatives 9, 12, and 13. In Alternative 9, wastewater would be conveyed to the Central Davis plant and in Alternatives 12 and 13 to the Salt Lake City plant.

Two alternative recommended plans are suggested; maintaining all four facilities at Level III (same as Alternative 2) or phasing out South Davis South and connecting it to South Davis North. The decision as to the best course of action is presently being investigated by the ongoing 208 programs.

Municipal Wastewater Management Alternatives - Salt Lake County (SLC)

For the purposes of this report, wastewater management in Salt Lake County has been divided into two areas. Wastewater in the Magna area is treated at the Magna facility and is discharged to Kersey Creek and thus to Great Salt Lake. All other facilities either discharge to the Jordan River, have no discharge, or, in the case of Salt Lake City, discharge to the Lake through a sewage canal. Thus, the Magna facility is discussed separately in the next section. This section contains a discussion of all those facilities in the Salt Lake Valley.

Currently, approximately one-half of the wastewaters generated in the Salt Lake Valley are treated at the Salt Lake City Treatment Plant and are subsequently discharged to the Salt Lake City Sewage Canal which flows to Great Salt Lake. The remaining half is treated at the Sandy City, Tri-Community, Murray City, Salt Lake County-Cottonwood, Granger-Hunter, Salt Lake City, Suburban Sanitation District No. 1, and South Salt Lake City facilities. These seven facilities discharge wastewater along a 14 mile reach of the Jordan River between 94th and 21st South. Future alternative wastewater management schemes for the area are presented in Table III-6 and illustrated in Figure III-5.

Utilization of existing treatment plant locations with upgrading and expansion is considered in Alternatives 1 and 2. Abandonment of Sandy City, Murray, Granger-Hunter, and South Salt Lake City is the theme of Alternatives 3 and 4. Alternatives 5 and 9 prescribe the abandonment of the Sandy, Murray, Cottonwood, Granger-Hunter, and South Salt Lake facilities. For these two alternatives, Sandy would be connected to Tri-Community and the remainder to Suburban Sanitation District No. 1. In Alternatives 6, 10, and 12, all facilities except Suburban Sanitation District No. 1 and Salt Lake City would be abandoned and connected to Suburban Sanitation District No. 1. Alternative 12 requires a discharge to Great Salt Lake at Salt Lake City. Alternatives 7, 8, and 11 consider regionalization at Salt Lake City with Alternative 8 requiring a discharge to Great Salt Lake.

The recommended plan is similar to Alternative 10, but includes the abandonment of the Camp Williams and State Prison facilities and connection to Suburban Sanitation District No. 1. An interceptor connecting these two facilities to Tri-Community has already been constructed. Additionally, interim upgrading is planned or is under construction at Tri-Community, Granger-Hunter, and Murray.

Two communities not addressed in the above discussion, Lark and Copperton, presently discharge to non-discharging lagoons. Because

TABLE III-6

MUNICIPAL WASTEWATER MANAGEMENT ALTERNATIVES - SALT LAKE COUNTY

<u>Alternative</u>	<u>Treatment Facility</u>	<u>Treatment Level</u> <u>III</u>	<u>Discharge to</u> <u>Great Salt Lake</u>	<u>Abandon/Connect To</u>
SLC-1	Sandy City Tri-Community Murray City Salt Lake County-Cottonwood Granger-Hunter Salt Lake City SSD No. 1 South Salt Lake City Salt Lake City	X X X X X X X X		
SLC-2	Sandy City Tri-Community Murray City Salt Lake County-Cottonwood Granger-Hunter Salt Lake City SSD No. 1 South Salt Lake City Salt Lake City	X X X X X X X X		
SLC-3	Sandy City Tri-Community Murray City Salt Lake County-Cottonwood Granger-Hunter Salt Lake City SSD No. 1 South Salt Lake City Salt Lake City		→ → → →	Tri-Community Cottonwood Salt Lake City SSD-1 Salt Lake City SSD-1

TABLE III-6 (Continued)
MUNICIPAL WASTEWATER MANAGEMENT ALTERNATIVES - SALT LAKE COUNTY

<u>Alternative</u>	<u>Treatment Facility</u>	<u>Treatment Level</u> <u>III</u> <u>IV</u>	<u>Discharge to</u> <u>Great Salt Lake</u>	<u>Abandon/Connect To</u>
SLC-4	Sandy City		→	Tri-Community
	Tri-Community	X		
	Murray City		→	Cottonwood
	Salt Lake County-Cottonwood	X		
	Granger-Hunter		→	Salt Lake City SSD-1
	Salt Lake City SSD No. 1	X		
SLC-5	South Salt Lake City		→	Salt Lake City SSD-1
	Salt Lake City	X		
	Sandy City		→	Tri-Community
	Tri-Community	X		
	Murray City		→	Salt Lake City SSD-1
	Salt Lake County-Cottonwood		→	Salt Lake City SSD-1
SLC-6	Granger-Hunter		→	Salt Lake City SSD-1
	Salt Lake City SSD No. 1	X		
	South Salt Lake City		→	Salt Lake City SSD-1
	Salt Lake City	X		
	Sandy City		→	Salt Lake City SSD-1
	Tri-Community		→	Salt Lake City SSD-1
SLC-7	Murray City		→	Salt Lake City SSD-1
	Salt Lake County-Cottonwood		→	Salt Lake City SSD-1
	Granger-Hunter		→	Salt Lake City SSD-1
	Salt Lake City SSD No. 1	X		
	South Salt Lake City		→	Salt Lake City SSD-1
	Salt Lake City	X		

TABLE III-6 (Continued)

MUNICIPAL WASTEWATER MANAGEMENT ALTERNATIVES - SALT LAKE COUNTY

Alternative	Treatment Facility	Treatment Level III	Discharge to Great Salt Lake	Abandon/Connect To
SLC-7	Sandy City		→	Salt Lake City
	Tri-Community		→	Salt Lake City
	Murray City		→	Salt Lake City
	Salt Lake County-Cottonwood		→	Salt Lake City
	Granger-Hunter		→	Salt Lake City
	Salt Lake City SSD No. 1		→	Salt Lake City
	South Salt Lake City		→	Salt Lake City
SLC-8	Salt Lake City	X		Salt Lake City
	Sandy City		→	Salt Lake City
	Tri-Community		→	Salt Lake City
	Murray City		→	Salt Lake City
	Salt Lake County-Cottonwood		→	Salt Lake City
	Granger-Hunter		→	Salt Lake City
	Salt Lake City SSD No. 1		→	Salt Lake City
	South Salt Lake City		→	Salt Lake City
	Salt Lake City	X	X	Salt Lake City
	Sandy City		→	Tri-Community
SLC-9	Tri-Community	X	→	Salt Lake City SSD-1
	Murray City		→	Salt Lake City SSD-1
	Salt Lake County-Cottonwood		→	Salt Lake City SSD-1
	Granger-Hunter		→	Salt Lake City SSD-1
	Salt Lake City SSD No. 1	X	→	Salt Lake City SSD-1
	South Salt Lake City		→	Salt Lake City SSD-1
	Salt Lake City	X	→	Salt Lake City SSD-1

TABLE III-6 (Continued)

MUNICIPAL WASTEWATER MANAGEMENT ALTERNATIVES - SALT LAKE COUNTY

Alternative	Treatment Facility	Treatment Level		Discharge to Great Salt Lake	Abandon/Connect To
		III	IV		
SLC-10*	Sandy City			→	Salt Lake City SSD-1
	Tri-Community			→	Salt Lake City SSD-1
	Murray City			→	Salt Lake City SSD-1
	Salt Lake County-Cottonwood			→	Salt Lake City SSD-1
	Granger-Hunter			→	Salt Lake City SSD-1
	Salt Lake City SSD No. 1	X			Salt Lake City SSD-1
SLC-11	South Salt Lake City			→	Salt Lake City SSD-1
	Salt Lake City	X			Salt Lake City SSD-1
	Sandy City			→	Salt Lake City
	Tri-Community			→	Salt Lake City
	Murray City			→	Salt Lake City
	Salt Lake County-Cottonwood			→	Salt Lake City
SLC-12	Granger-Hunter			→	Salt Lake City
	Salt Lake City SSD No. 1			→	Salt Lake City
	South Salt Lake City			→	Salt Lake City
	Salt Lake City	X			Salt Lake City
	Sandy City			→	Salt Lake City SSD-1
	Tri-Community			→	Salt Lake City SSD-1
SLC-12	Murray City			→	Salt Lake City SSD-1
	Salt Lake County-Cottonwood			→	Salt Lake City SSD-1
	Granger-Hunter			→	Salt Lake City SSD-1
	Salt Lake City SSD No. 1	X			Salt Lake City SSD-1
	South Salt Lake City			→	Salt Lake City SSD-1
	Salt Lake City	X		→	Salt Lake City SSD-1

*Recommended Plan

FIGURE III-5

WASTEWATER TREATMENT ALTERNATIVES - SALT LAKE COUNTY

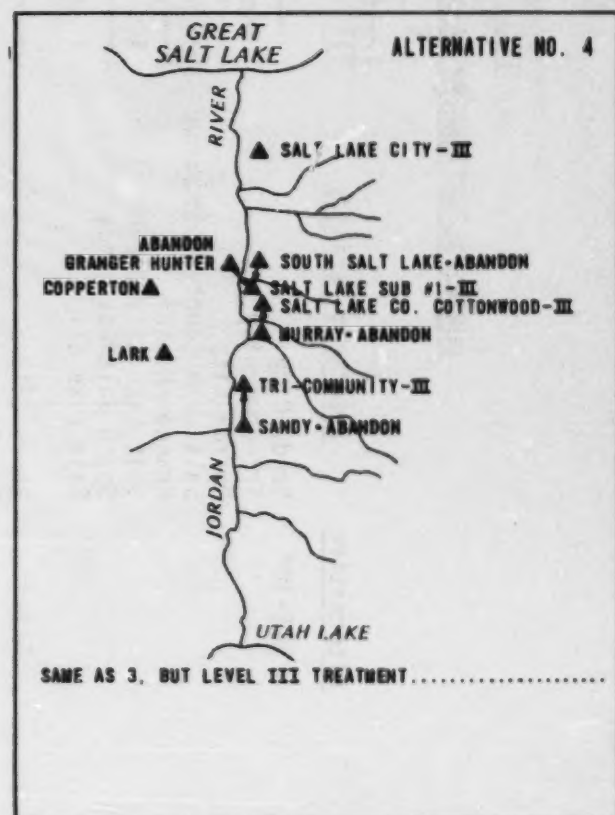
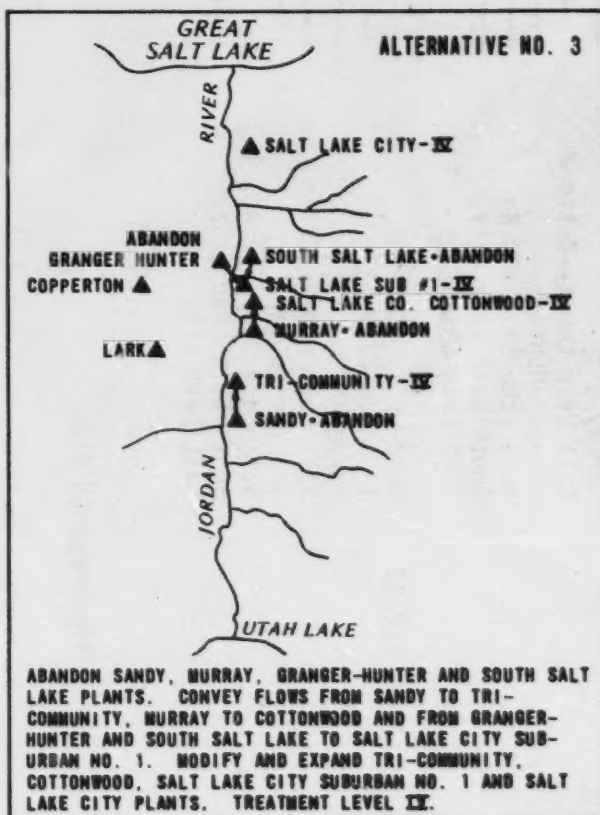
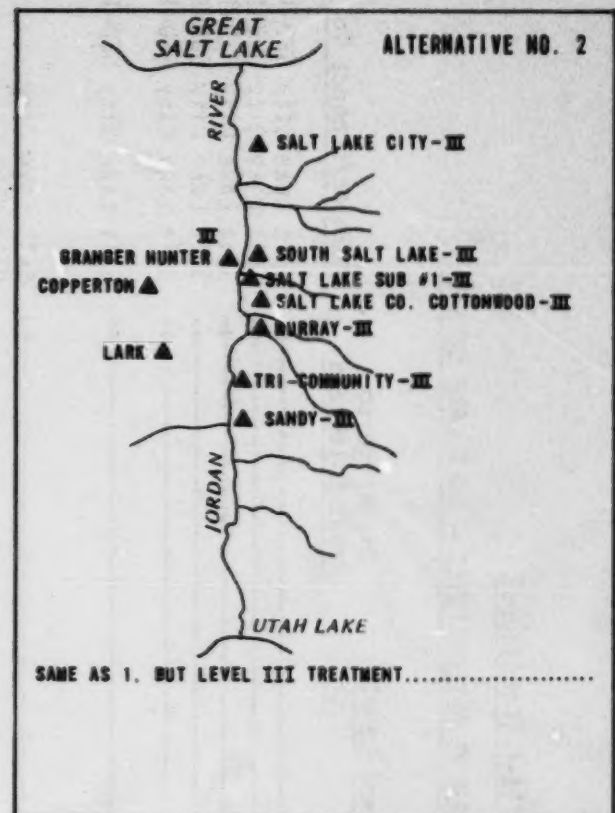
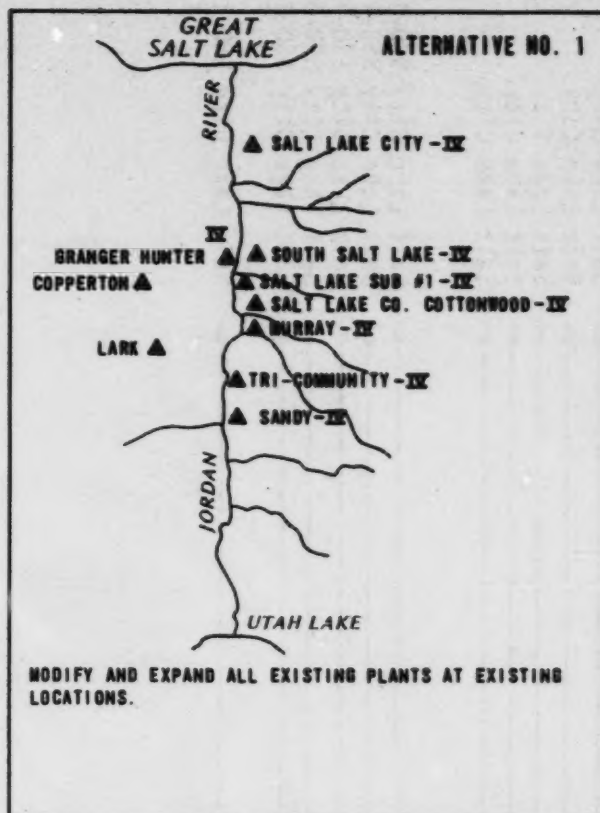


FIGURE III-5 (Continued)

WASTEWATER TREATMENT ALTERNATIVES - SALT LAKE COUNTY

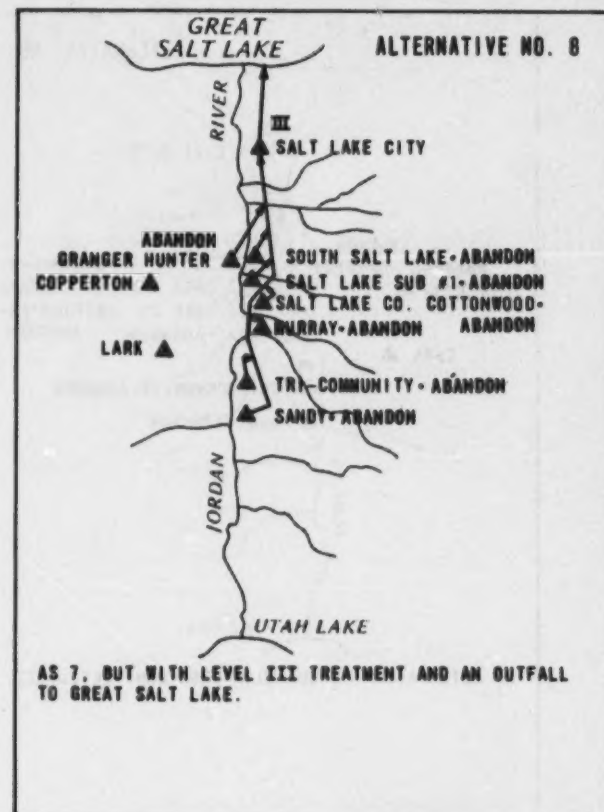
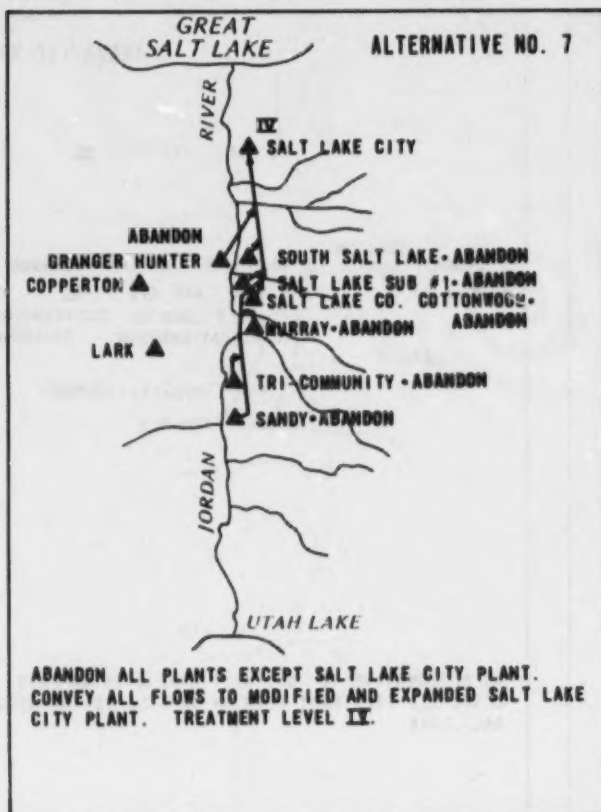
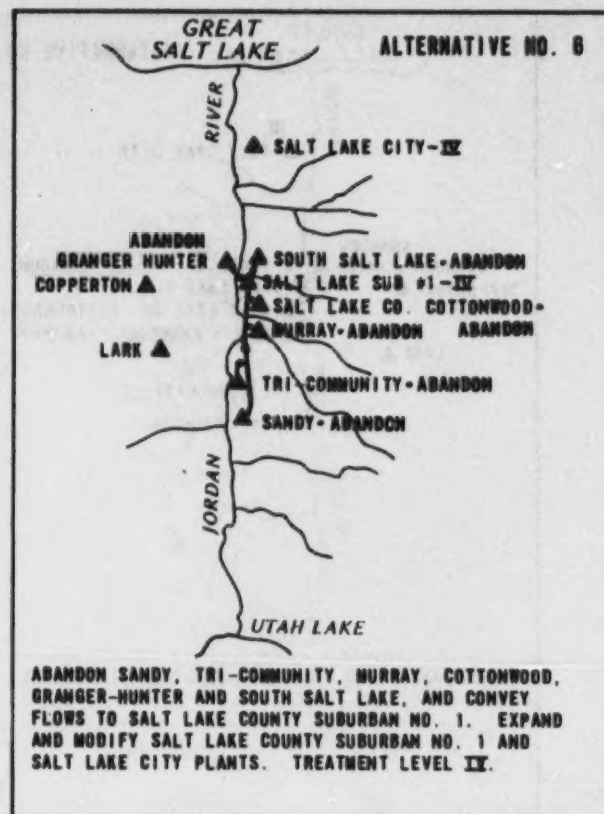
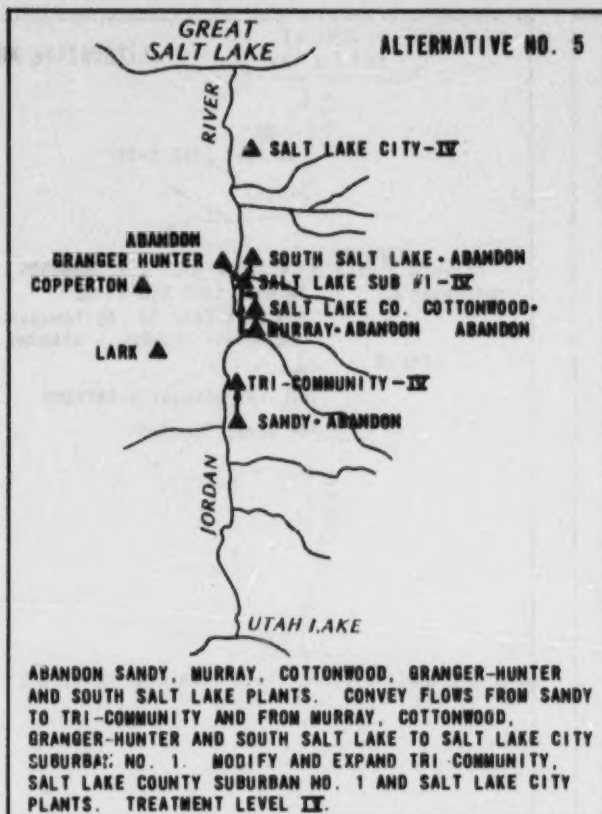


FIGURE III-5 (Continued)

WASTEWATER TREATMENT ALTERNATIVES - SALT LAKE COUNTY

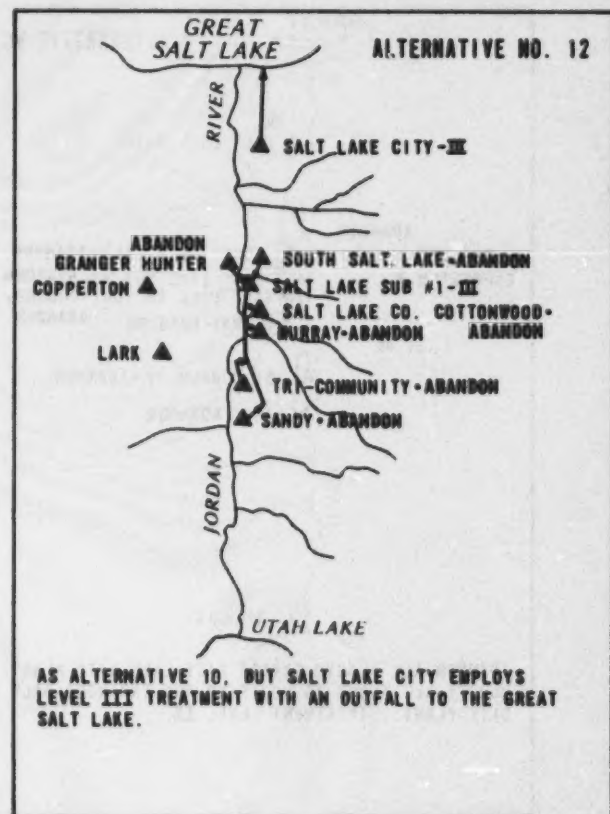
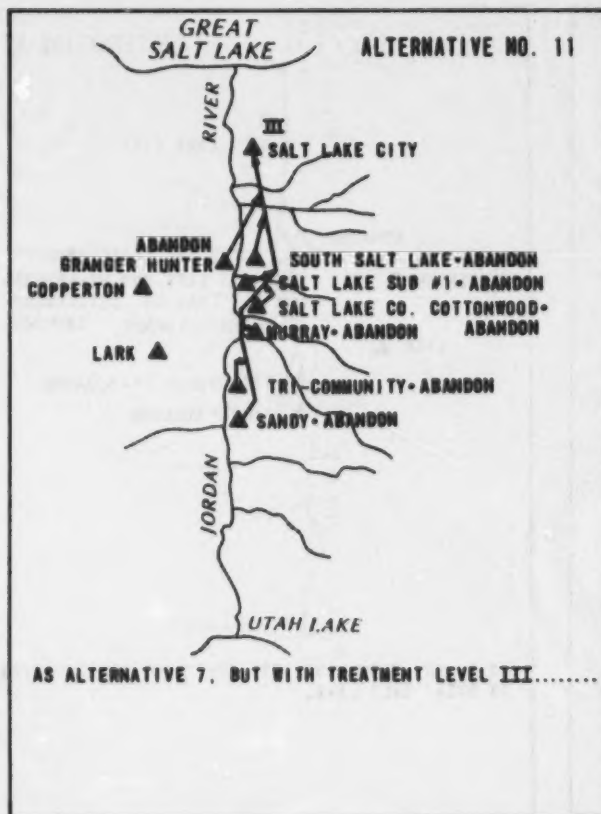
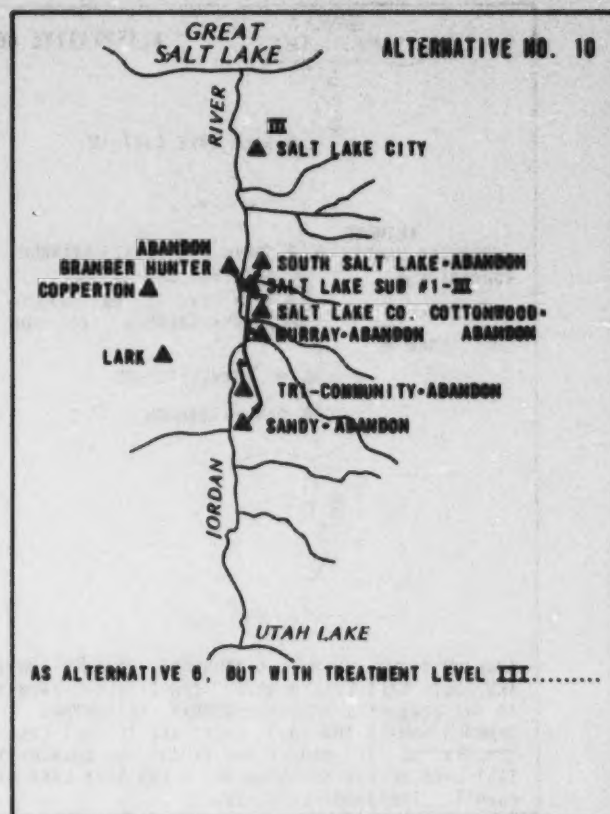
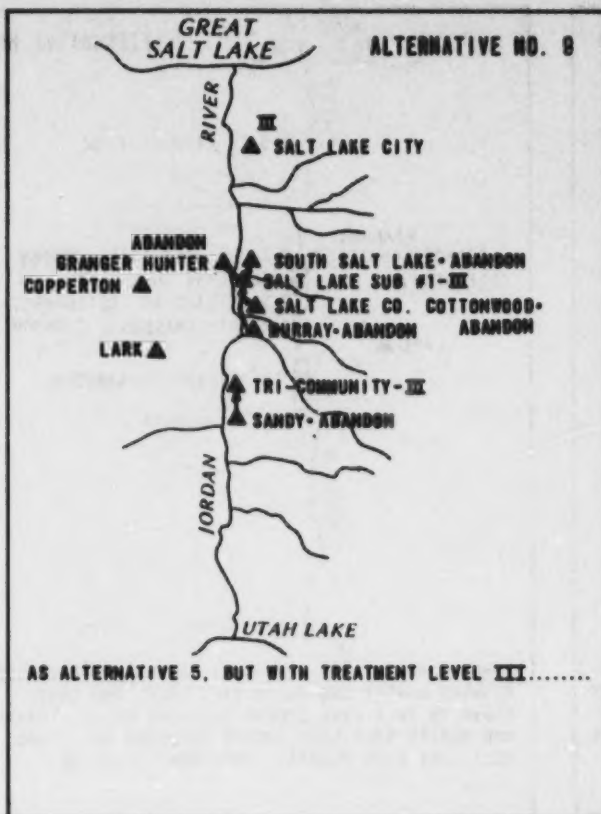
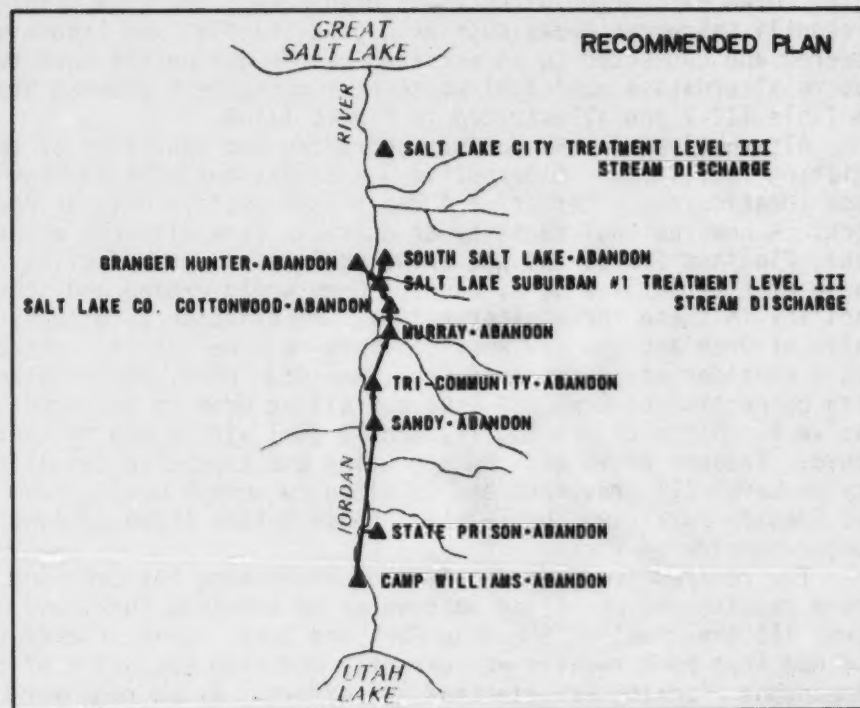


FIGURE III-5 (Continued)

WASTEWATER TREATMENT ALTERNATIVES - SALT LAKE COUNTY



significant growth is not expected in these communities, the Plan recommends continuation of the existing systems. The ongoing 208 Programs are reviewing this recommendation.

Municipal Wastewater Management Alternatives - Magna Area (MA)

Municipal wastewater in the Magna area is currently treated in a trickling filter plant. Only one alternative is considered for future wastewater management; i.e., upgrading of the Magna facility to Level III.

Municipal Wastewater Management Alternatives - Northern Utah County (NUC)

Northern Utah County is defined as the area served by the Lehi, American Fork, Pleasant Grove, and Orem treatment plants. All these facilities except Orem discharge to ditches or streams leading to Utah Lake. Orem discharges directly to Utah Lake. The Plan assumed that presently unsewered areas such as Alpine, Manila, and Lindon will be sewered and connected to an existing system during the next twenty years. Future alternative municipal wastewater management schemes are presented in Table III-7 and illustrated in Figure III-6.

Alternatives 1 - 4 consider upgrading and expansion of the four existing facilities. Alternative 3 includes outfalls to Utah Lake at each location and Alternative 4 has a lake outfall only at American Fork. A new regional facility at American Fork with the abandonment of Lehi, Pleasant Grove, and the existing American Fork facility is the theme of Alternatives 5, 6, and 7. Orem would expand and upgrade its facility in these three alternatives. Alternative 7 includes lake outfalls at Orem and the new American Fork regional plant. Alternatives 8 and 9 consider abandonment of Lehi, American Fork, and Pleasant Grove with connection to Orem. A lake outfall at Orem is included in Alternative 8. Alternatives 10, 11, and 12 deal with a new regional plant at Provo. Because Provo will be upgrading and expanding the existing facility to Level III treatment and is sized to accept wastes from Springville and Spanish Fork (see Chapter IV), these latter three options are no longer considered viable.

The recommended plan consists of abandoning the Lehi and Pleasant Grove facilities, conveying wastewater to American Fork, and establishing Level III treatment at American Fork and Orem. Lehi, Pleasant Grove, and American Fork facilities currently comprise the basis of the Timpanogos Planning Associations 201 effort. A new regional plant is anticipated. In the interim, plans are underway to expand and upgrade the American Fork, Pleasant Grove, and Lehi facilities. A Step 1 - 201 Grant has been awarded to Orem to study the feasibility of upgrading to Level III. Lindon is constructing a collection system and connecting to Orem. Alpine will convey its wastewater to the proposed Timpanogos facility.

Municipal Wastewater Management Alternatives - Central Utah County (CUC)

Central Utah County is defined as that area served by the Provo, Springville, Spanish Fork, Payson, and Salem treatment plants. In

TABLE III-7
MUNICIPAL WASTEWATER MANAGEMENT ALTERNATIVES - NORTHERN UTAH COUNTY

<u>Alternative</u>	<u>Treatment Facility</u>	<u>Treatment Level</u> <u>III</u>	<u>Treatment Level</u> <u>IV</u>	<u>Discharge to</u> <u>Utah Lake</u>	<u>Abandon/Connect To</u>
NUC-1	Lehi American Fork Pleasant Grove Orem		X		
			X		
			X		
			X		
NUC-2	Lehi American Fork Pleasant Grove Orem	X			
		X			
		X			
		X			
NUC-3	Lehi American Fork Pleasant Grove Orem	X		X	
		X		X	
		X		X	
		X		X	
NUC-4	Lehi American Fork Pleasant Grove Orem		X		
			X		
			X		
NUC-5	Lehi American Fork Pleasant Grove Orem				New American Fork {IV}
					New American Fork {IV}
					New American Fork {IV}
			X		
NUC-6	Lehi American Fork Pleasant Grove Orem				New American Fork {III}
					New American Fork {III}
					New American Fork {III}
		X			

TABLE III-7 (Continued)

MUNICIPAL WASTEWATER MANAGEMENT ALTERNATIVES - NORTHERN UTAH COUNTY

Alternative	Treatment Facility	Treatment Level III	Treatment Level IV	Discharge to Utah Lake	Abandon/Connect To
NUC-7	Lehi				New American Fork { III + Lake }
	American Fork				New American Fork { III + Lake }
	Pleasant Grove				New American Fork { III + Lake }
	Orem	X		X	
NUC-8	Lehi				Orem
	American Fork				Orem
	Pleasant Grove				Orem
	Orem	X		X	
NUC-9	Lehi				Orem
	American Fork				Orem
	Pleasant Grove				Orem
	Orem		X		Orem
NUC-10	Lehi				New Provo { III + Lake }
	American Fork				New Provo { III + Lake }
	Pleasant Grove				New Provo { III + Lake }
	Orem				New Provo { III + Lake }
NUC-11	Lehi				New Provo { IV + Bay }
	American Fork				New Provo { IV + Bay }
	Pleasant Grove				New Provo { IV + Bay }
	Orem				New Provo { IV + Bay }
NUC-12	Lehi				New Provo { III + Bay }
	American Fork				New Provo { III + Bay }
	Pleasant Grove				New Provo { III + Bay }
	Orem				New Provo { III + Bay }

TABLE III-7 (Continued)

MUNICIPAL WASTEWATER MANAGEMENT ALTERNATIVES - NORTHERN UTAH COUNTY

<u>Alternative</u>	<u>Treatment Facility</u>	<u>Treatment Level</u>	<u>Discharge to Utah Lake</u>	<u>Abandon/Connect To</u>
		<u>III</u>		
		X	→	American Fork
		X	→	American Fork

Lehi
American Fork
Pleasant Grove
Orem

Recommended
Plan

FIGURE III-6
WASTEWATER TREATMENT ALTERNATIVES - NORTHERN UTAH COUNTY

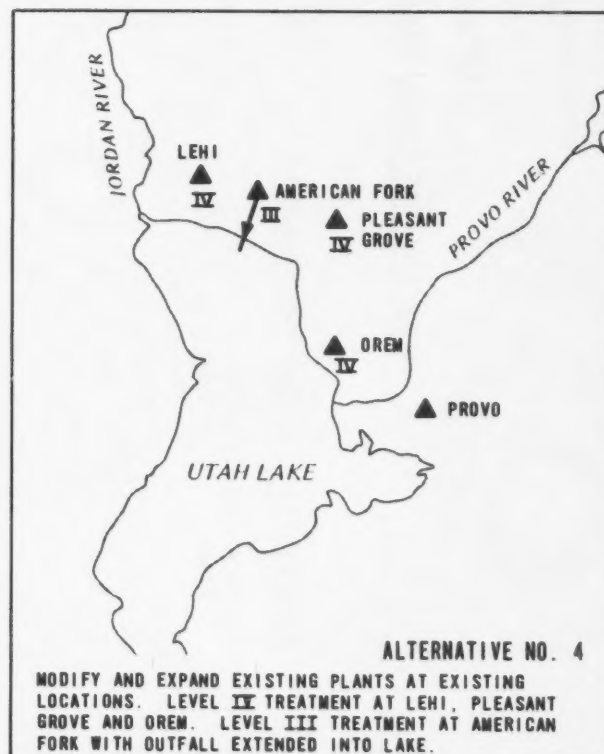
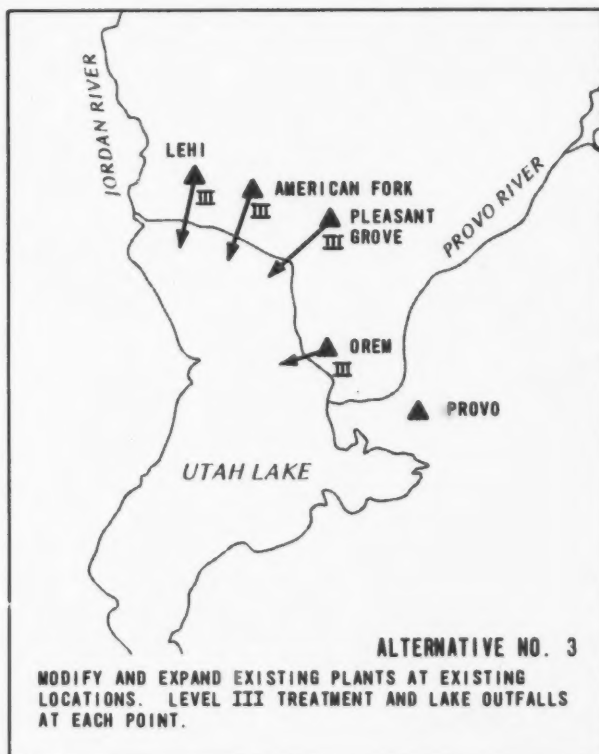
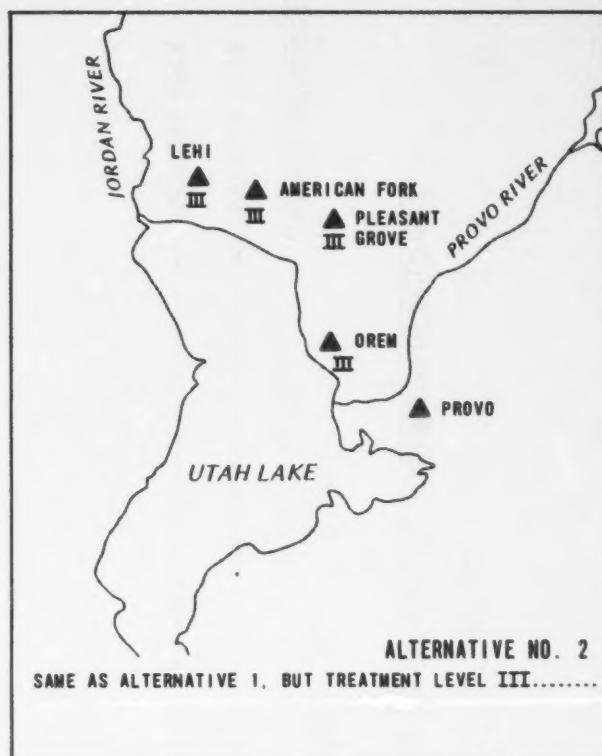
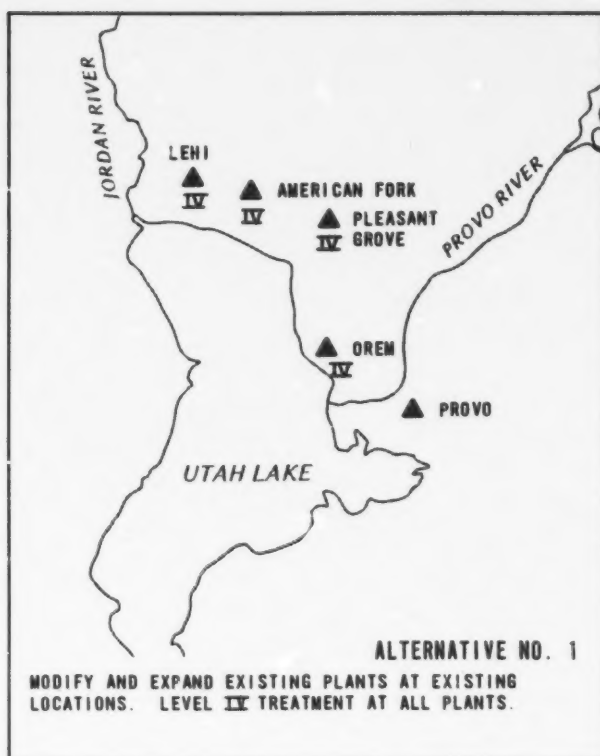


FIGURE III-6 (Continued)

WASTEWATER TREATMENT ALTERNATIVES - NORTHERN UTAH COUNTY

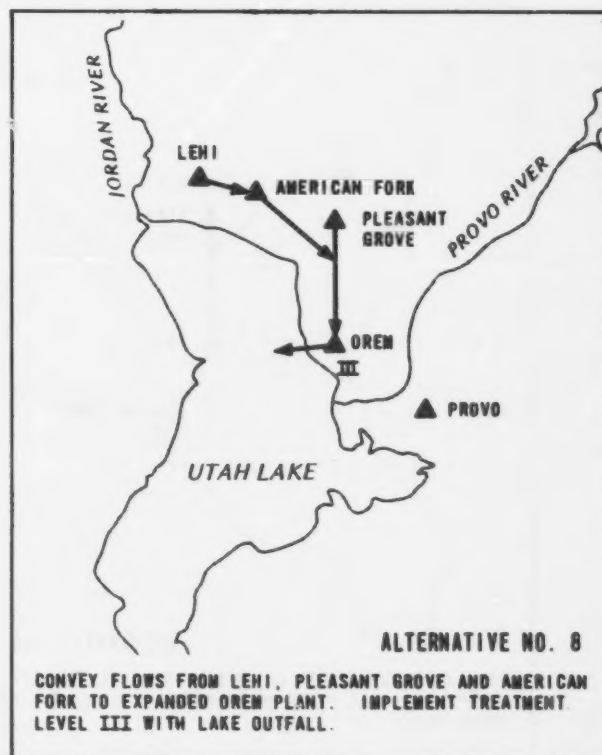
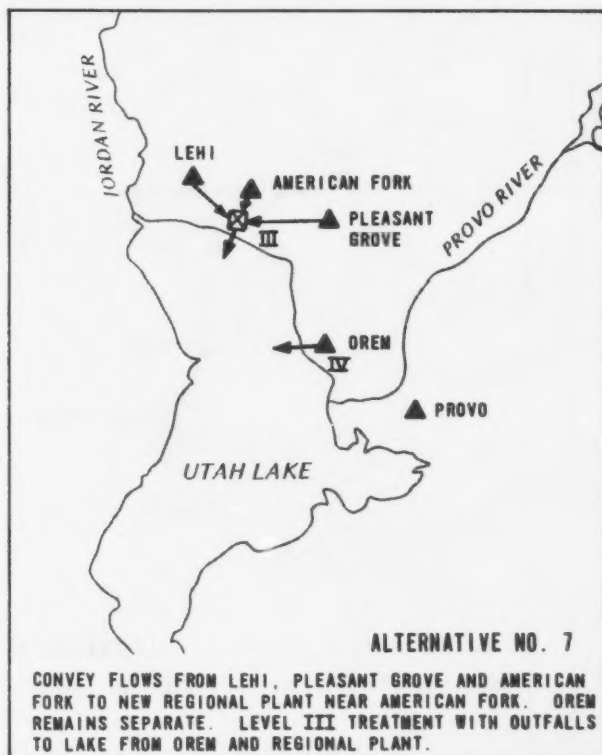
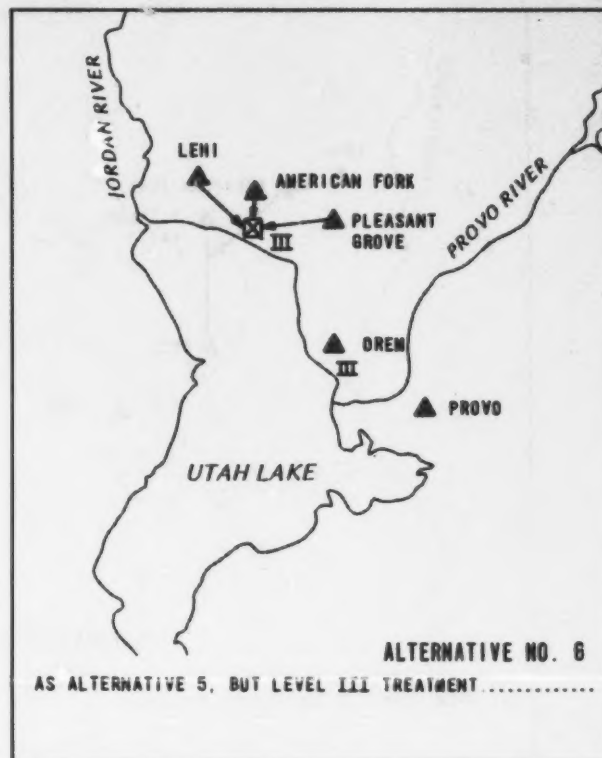


FIGURE III-6 (Continued)

WASTEWATER TREATMENT ALTERNATIVES - NORTHERN UTAH COUNTY

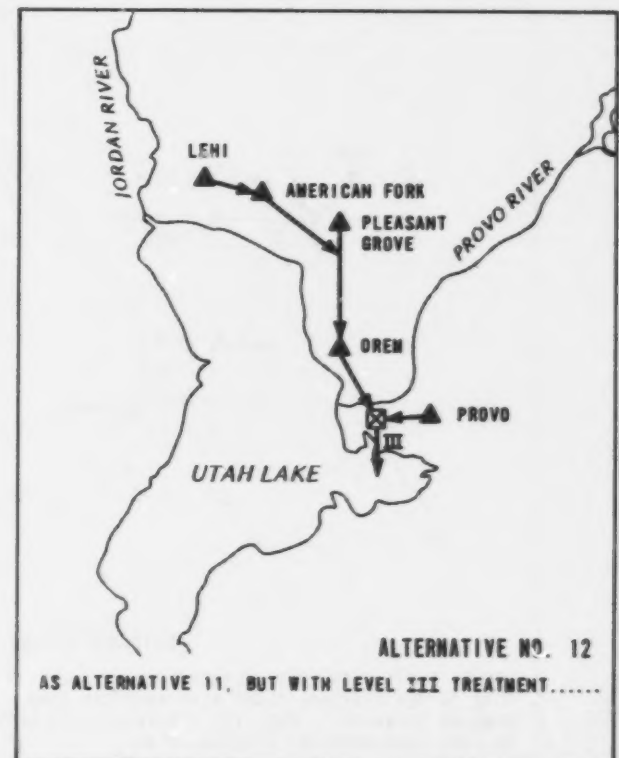
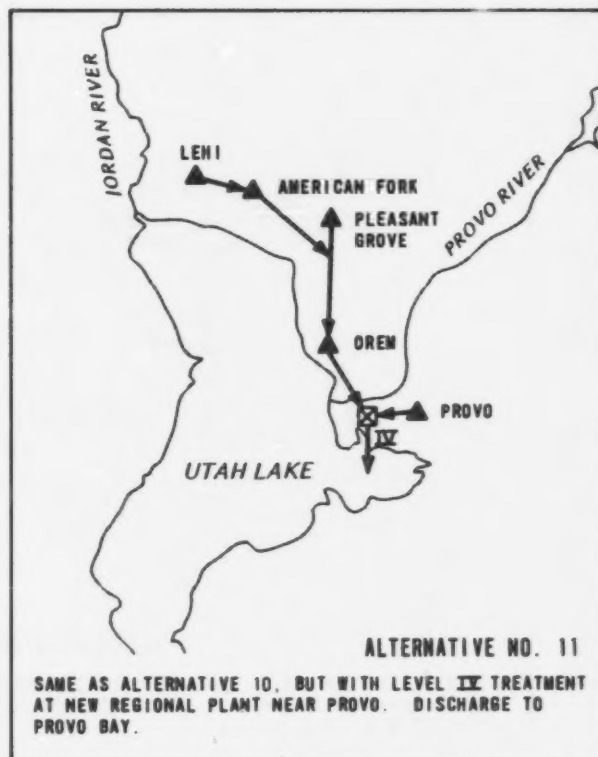
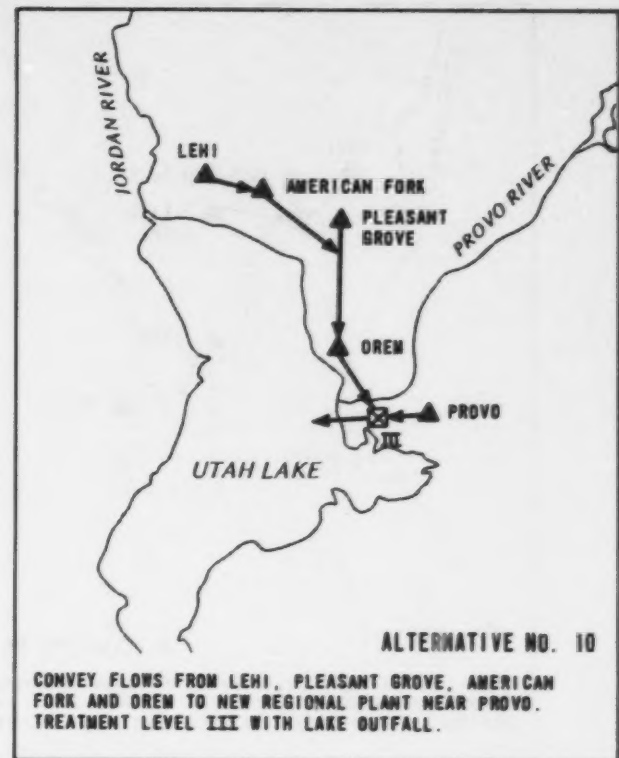
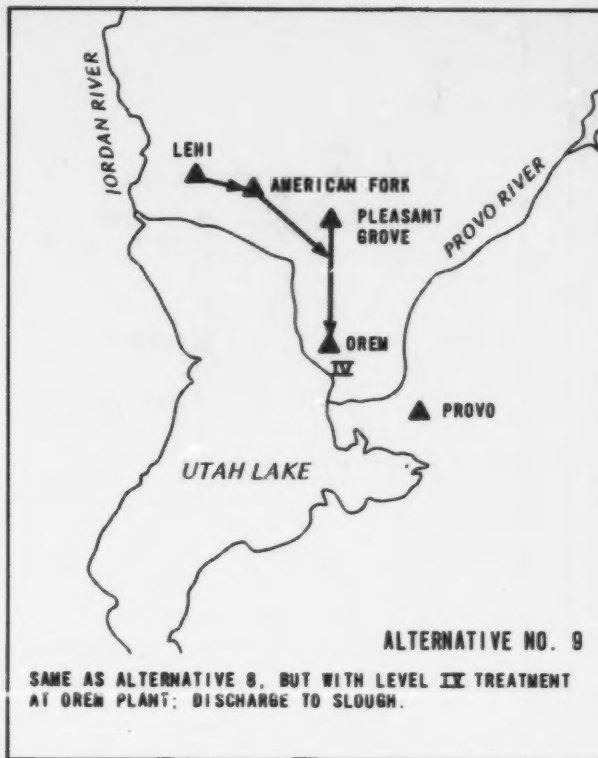
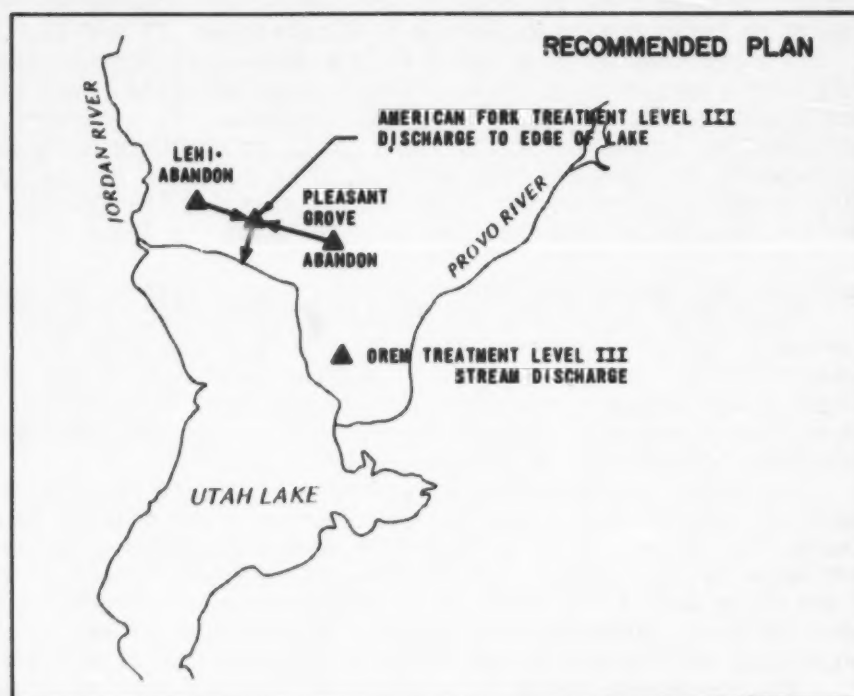


FIGURE III-6 (Continued)

WASTEWATER TREATMENT ALTERNATIVES - NORTHERN UTAH COUNTY



developing wastewater management alternatives, it was assumed that unsewered areas such as Mapleton and Salem Hills will be sewered and connected to existing system during the planning period. Alternative future wastewater management schemes for Central Utah County are presented in Table III-8 and illustrated in Figure III-7.

Upgrading and expansion of the existing treatment facilities is suggested in Alternatives 1 and 2. Abandonment of Salem's facility and connection to Payson is considered in Alternatives 3 and 4. Alternatives 5, 6, and 7 focus on abandonment of Springville and Spanish Fork and connection to Provo. A discharge to Utah Lake is suggested for Provo in Alternative 7. In Alternatives 8 and 9, only Springville is abandoned and connected to Provo. A discharge to Utah Lake at Provo is included in both alternatives. Springville, Spanish Fork, Salem, and Payson are all abandoned and connected to Provo in Alternatives 10, 11, and 12. An outfall to Utah Lake at Provo is considered in Alternative 10 while discharge to Provo Bay is suggested in Alternatives 11 and 12.

The recommended plan requires abandonment of Springville and Spanish Fork with connection to Provo. Salem would maintain Level II treatment and discharge its effluent to Payson for Level III treatment. Provo is anticipating expansion of its facility to accommodate wastewater from Springville and Spanish Fork and upgrading to Level III by 1978. Spanish Fork is currently planning interim upgrading and Springville is studying the feasibility of constructing an interceptor to Provo.

Municipal Wastewater Management Alternatives - Wasatch County (WC)

Heber City and Midway are the only communities in Wasatch County currently operating wastewater collection and treatment facilities. Heber's collection system suffers massive infiltration and all future alternatives assume correction of this problem. Alternative future wastewater management systems for Wasatch County are presented in Table III-9 and illustrated in Figure III-8.

Expansion and upgrading of existing treatment facilities is the basis of Alternatives 1 and 2. Alternative 2 specifies a Provo River discharge for Heber. Alternatives 3, 4, and 5 consider a new regional facility for Heber Valley. Alternatives 3 and 5 require a discharge to the Provo River above Deer Creek Reservoir. Alternative 4 includes Level II treatment followed by percolation basins. Abandonment of the Heber and Midway facilities and connection to Provo is suggested in Alternative 6.

The recommended plan includes Level II treatment at Midway and Heber and effluent conveyance to a new regional facility at Charleston for Level III treatment. It was also assumed that wastewater from Wallsburg would be collected and conveyed out of the County to Provo by means of the proposed Provo Canyon interceptor. Heber City is currently involved in infiltration control and Midway is studying upgrading measures. Additionally, the Provo Canyon Sewer District is actively studying the feasibility of the Provo Canyon interceptor.

Municipal Wastewater Management Alternatives - Overall Utah and Wasatch Counties (OU/WC)

In addition to the separate alternatives for Northern Utah County, Central Utah County, and Wasatch County previously discussed, several

TABLE III-8

MUNICIPAL WASTEWATER MANAGEMENT ALTERNATIVES - CENTRAL UTAH COUNTY

<u>Alternative</u>	<u>Treatment Facility</u>	<u>Treatment Level</u> <u>III</u>	<u>Treatment Level</u> <u>IV</u>	<u>Discharge to</u> <u>Utah Lake</u>	<u>Abandon/Connect To</u>
CUC-1	Provo Springville Spanish Fork Salem Payson		X X X X X		
CUC-2	Provo Springville Spanish Fork Salem Payson	X X X X X			
CUC-3	Provo Springville Spanish Fork Salem Payson		X X X		Payson
CUC-4	Provo Springville Spanish Fork Salem Payson	X X X X			Payson
CUC-5	Provo Springville Spanish Fork Salem Payson		X		Provo Provo

TABLE III-8 (Continued)

MUNICIPAL WASTEWATER MANAGEMENT ALTERNATIVES - CENTRAL UTAH COUNTY

Alternative	Treatment Facility	Treatment Level III	Treatment Level IV	Discharge to Utah Lake	Abandon/Connect To
CUC-6	Provo	X			
	Springville			→	Provo
	Spanish Fork			→	Provo
	Salem	X			
CUC-7	Payson	X			
	Provo	X		X	
	Springville			→	Provo
	Spanish Fork			→	Provo
CUC-8	Salem	X			
	Payson	X			
	Provo	X		X	
	Springville			→	Provo
CUC-9	Spanish Fork		X		
	Salem		X		
	Payson		X		
	Provo	X		X	
CUC-10	Springville			→	Provo
	Spanish Fork			→	Provo
	Salem			→	Provo
	Payson			→	Provo

TABLE III-8 (Continued)

MUNICIPAL WASTEWATER MANAGEMENT ALTERNATIVES - CENTRAL UTAH COUNTY

Alternative	Treatment Facility	Treatment Level <u>III</u>	Treatment Level <u>IV</u>	Discharge to Utah Lake	Abandon/Connect To
CUC-11	Provo		X	(Bay)	Provo
	Springville				Provo
	Spanish Fork				Provo
	Salem				Provo
CUC-12	Payson				Provo
	Provo	X		(Bay)	Provo
	Springville				Provo
	Spanish Fork				Provo
Recommended Plan	Salem				Provo
	Payson				Provo
	Provo	X			Provo
	Springville				Provo
	Spanish Fork				Provo
	Salem				Provo
	Payson				Provo
		X		Level II Discharge to Payson	Provo

FIGURE III-7
WASTEWATER TREATMENT ALTERNATIVES - CENTRAL UTAH COUNTY

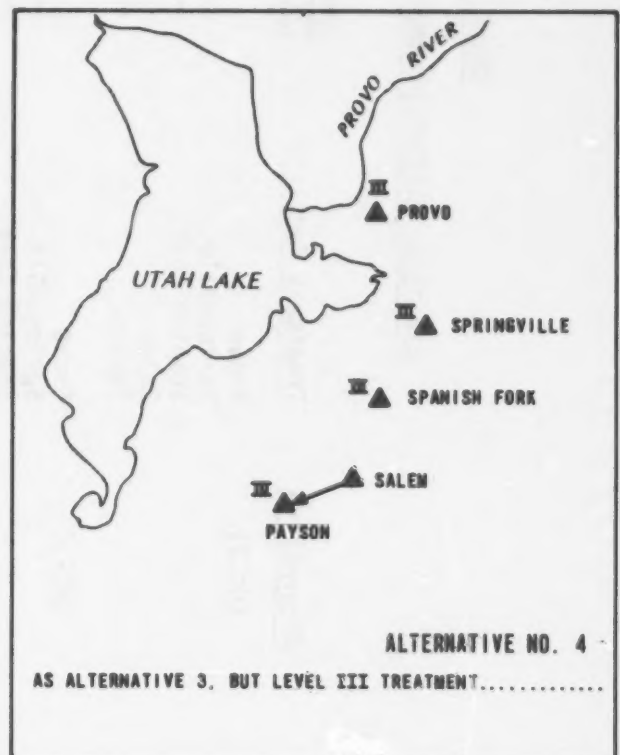
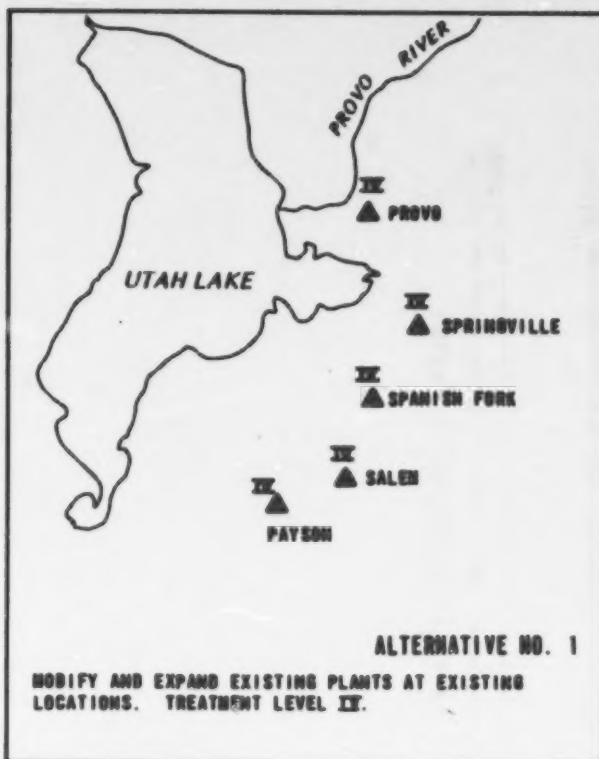


FIGURE III-7 (Continued)

WASTEWATER TREATMENT ALTERNATIVES - CENTRAL UTAH COUNTY

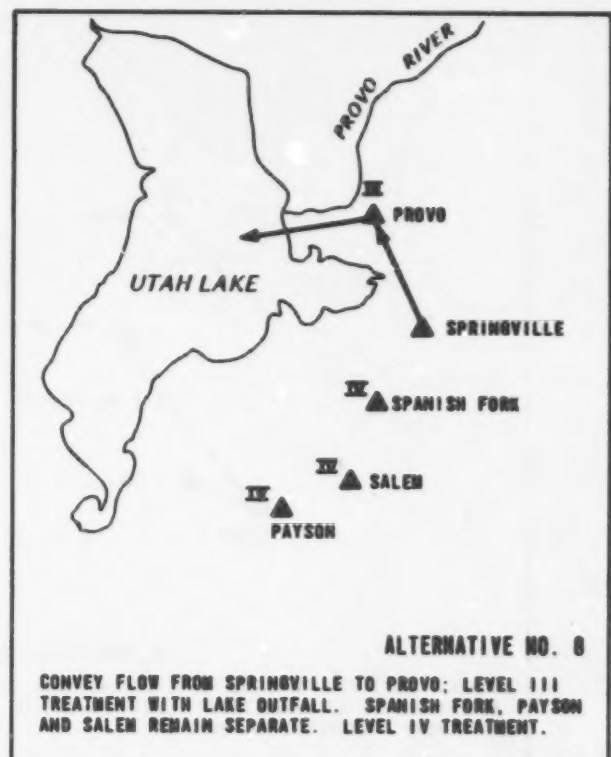
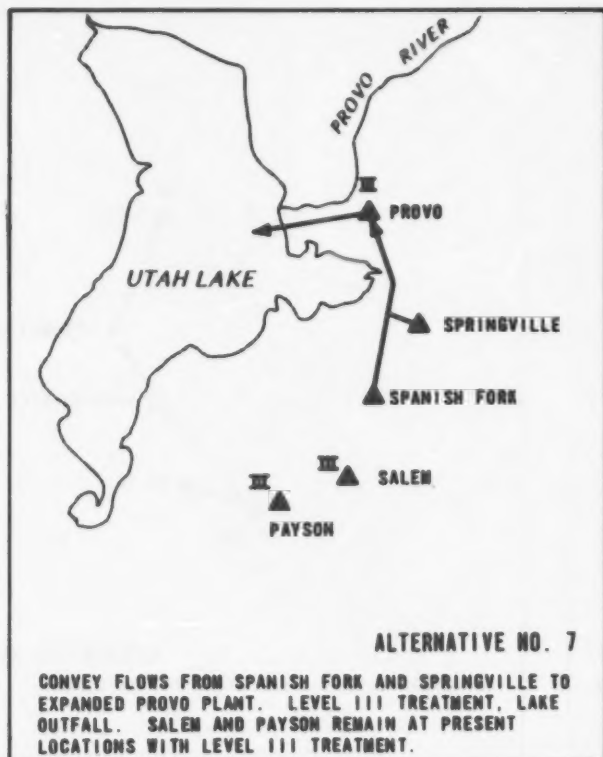
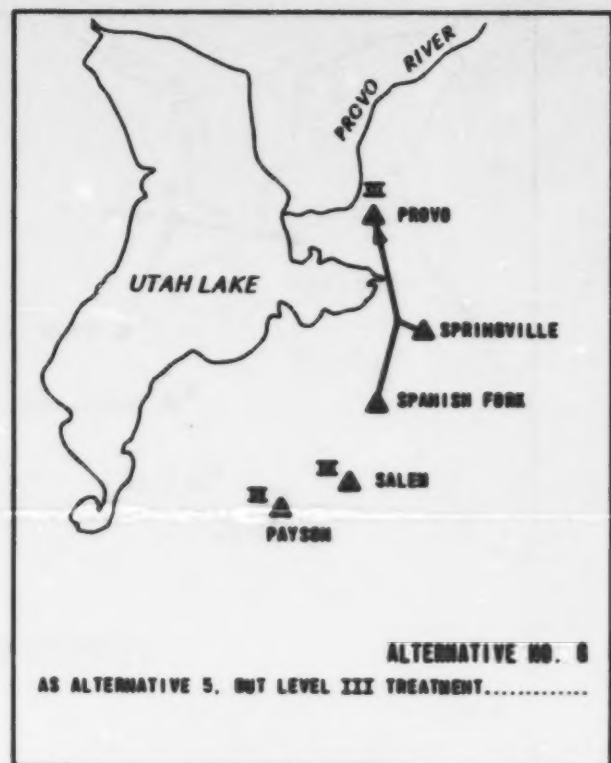
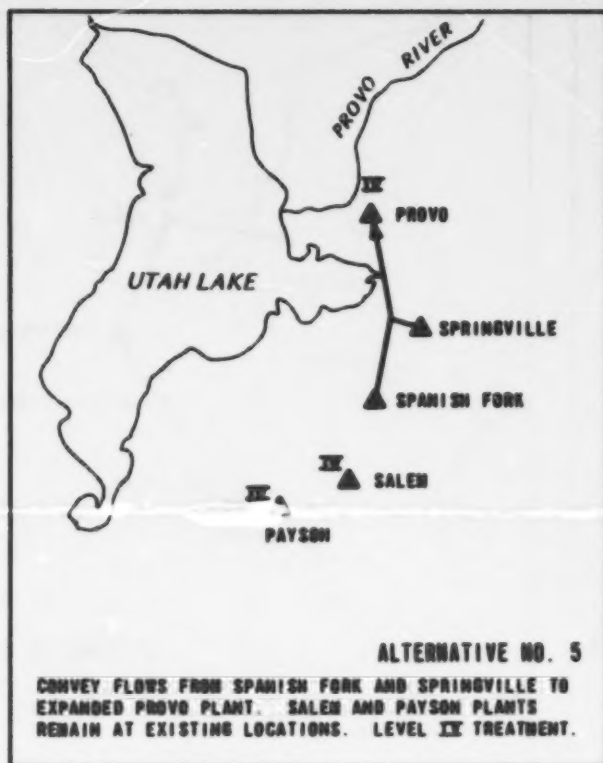


FIGURE III-7 (Continued)

WASTEWATER TREATMENT ALTERNATIVES - CENTRAL UTAH COUNTY

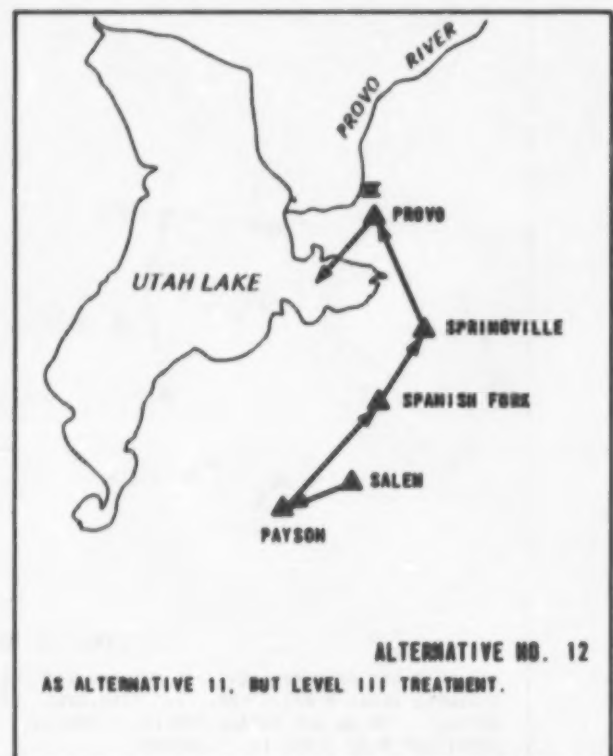
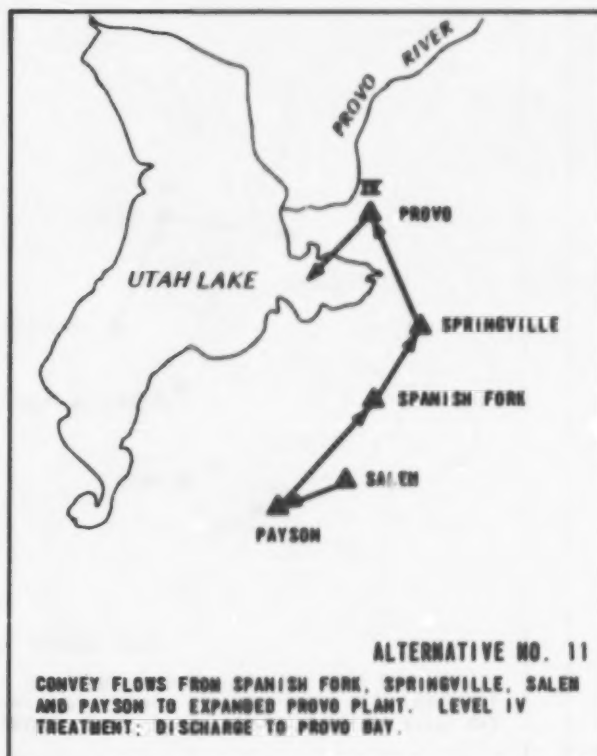
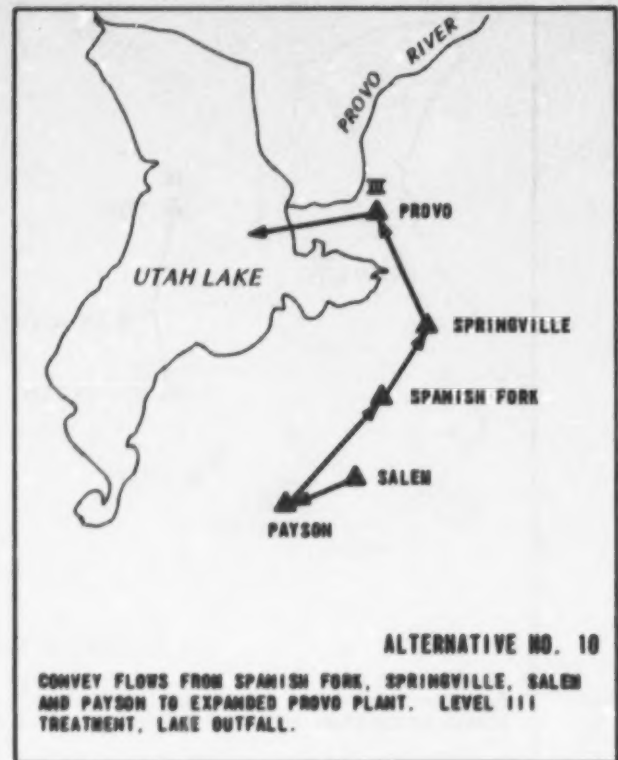


FIGURE III-7 (Continued)
WASTEWATER TREATMENT ALTERNATIVES - CENTRAL UTAH COUNTY

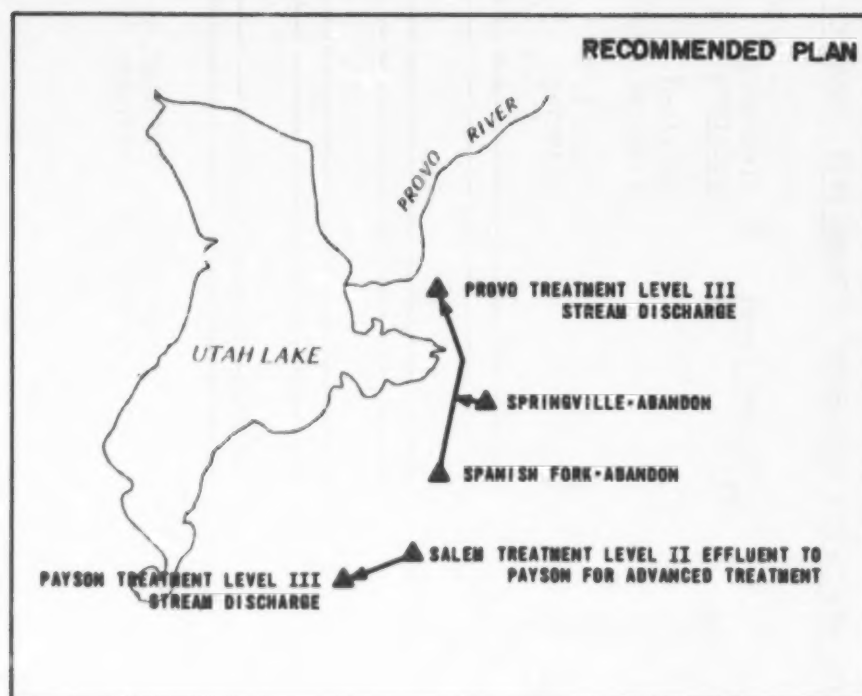


TABLE III-9

MUNICIPAL WASTEWATER MANAGEMENT ALTERNATIVES - WASATCH COUNTY

<u>Alternative</u>	<u>Treatment Facility</u>	<u>Treatment Level</u> <u>III</u>	<u>Discharge</u> <u>Location</u>	<u>Abandon/Connect To</u>
WC-1	Heber Midway	X X	Existing Existing	
WC-2	Heber Midway	X X	Provo R. Existing	
WC-3	Heber Midway			New Charleston Level III - Provo R.
WC-4	Heber Midway			New South of Heber Level II - Percolation
WC-5	Heber Midway			New South of Heber Level IV - Provo R.
WC-6	Heber Midway			Provo Provo
Recommended Plan	Heber Midway			Level II - Effluent to Charleston Level III Level II - Effluent to Charleston Level III

FIGURE III-8

WASTEWATER TREATMENT ALTERNATIVES - WASATCH COUNTY

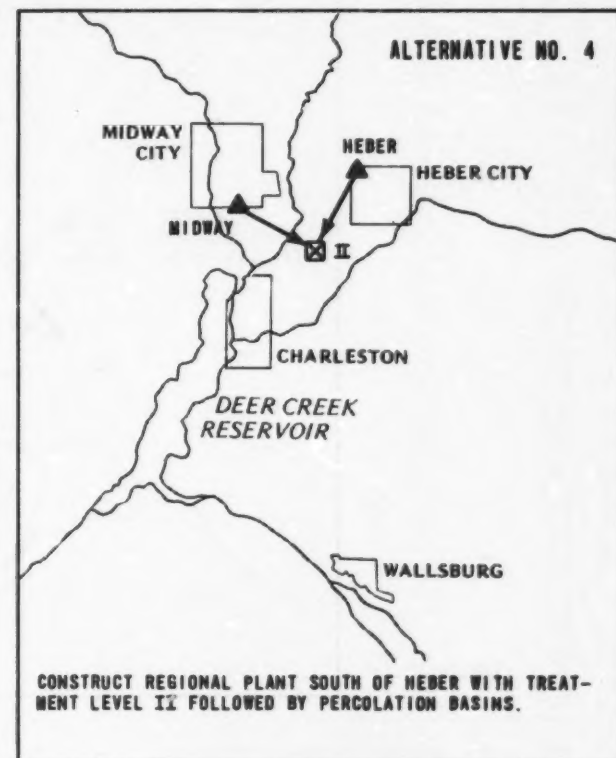
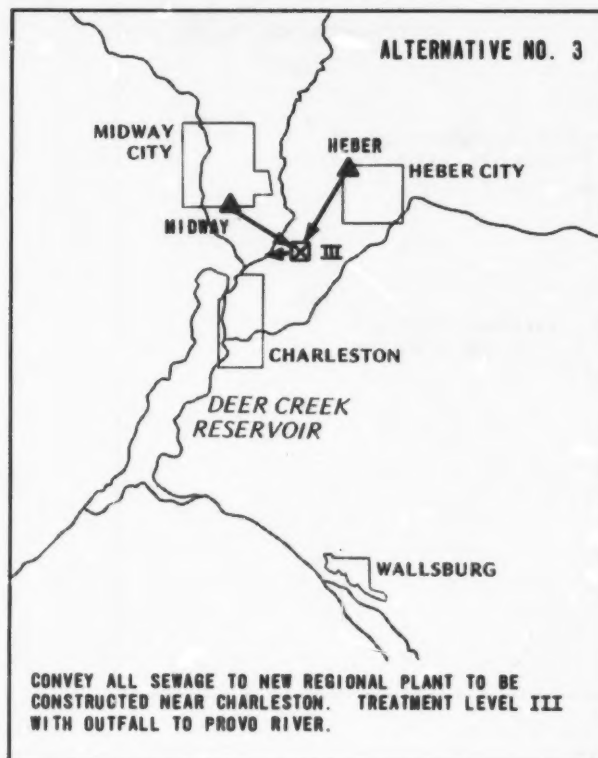
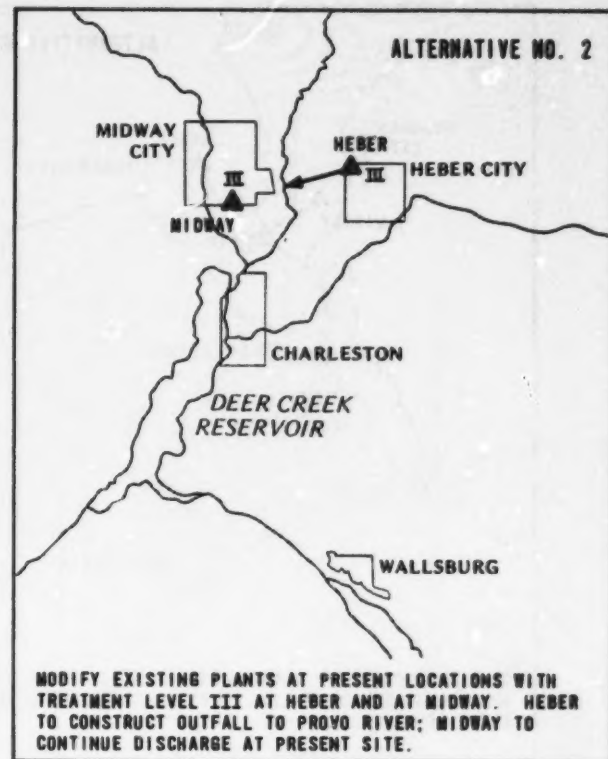
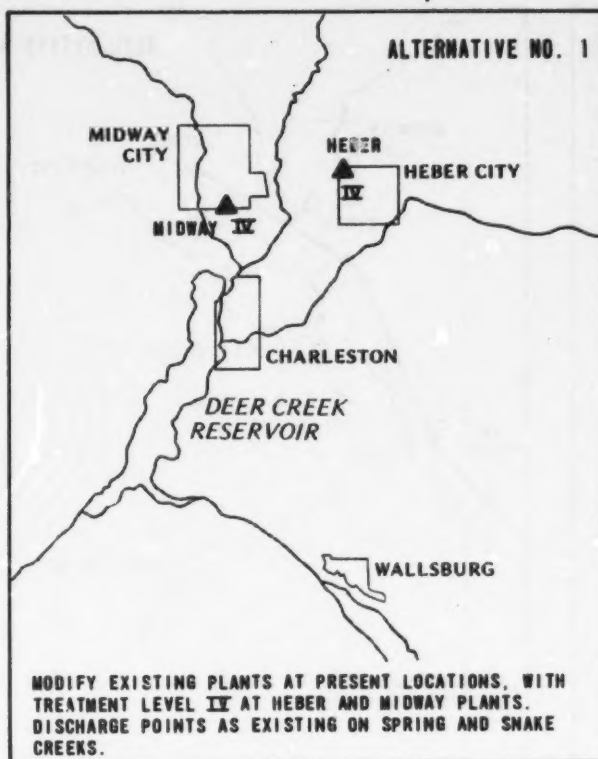
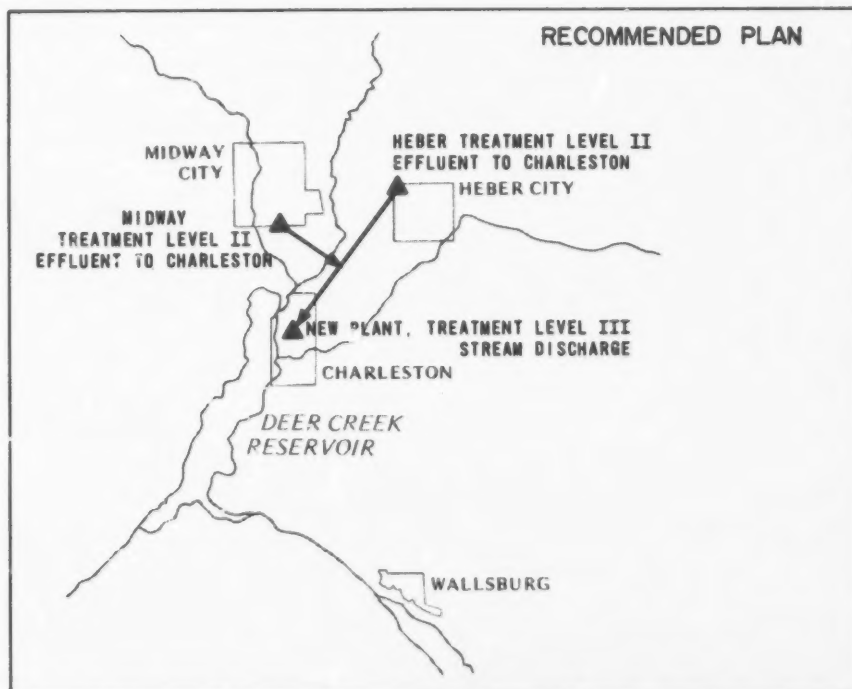
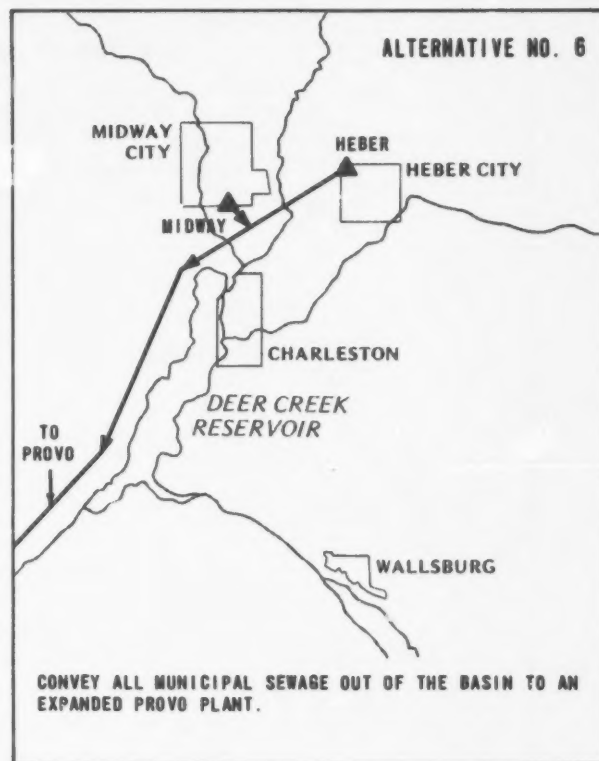
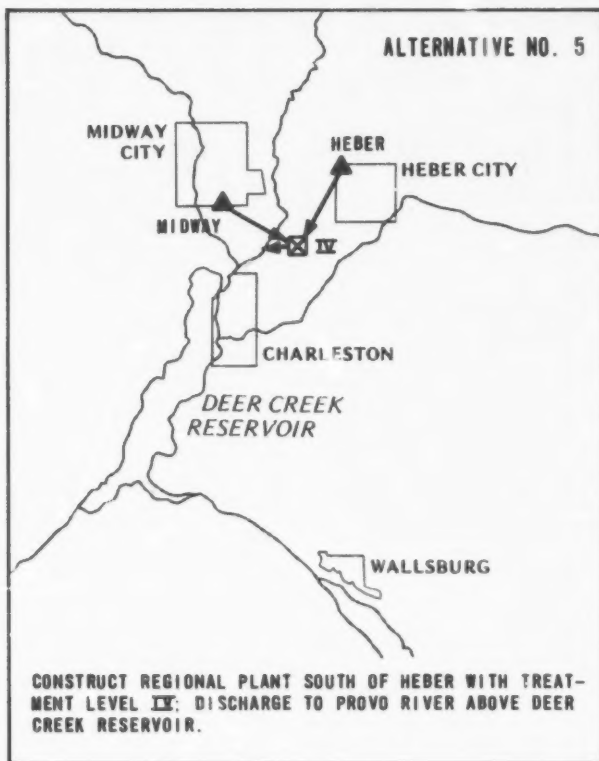


FIGURE III-8 (Continued)

WASTEWATER TREATMENT ALTERNATIVES - WASATCH COUNTY



alternatives were considered for consolidation of wastewater management within these areas. These alternatives are presented in Table III-10 and illustrated in Figure III-9.

In Alternatives 1 and 2, all wastewater flows from Northern and Central Utah County would be routed to a new regional facility at Provo and discharged to Provo Bay after treatment; only the level of treatment varies. Alternative 3 is identical to Alternative 2 except ultimate discharge would be to Utah Lake. The Heber Valley area is not considered in Alternatives 1, 2, and 3. Alternatives 4, 5, and 6 consider regional treatment at a new Provo facility of flows from Northern and Central Utah County and from Wasatch County. A Provo Bay discharge is included in Alternatives 4 and 5, whereas Alternative 6 includes a discharge to Utah Lake. Level IV treatment is specified in Alternative 4 and Level III in Alternatives 5 and 6.

The plans to upgrade and expand the existing Provo facility to accept future wasteloads from the Provo area including Springville and Spanish Fork would seem to preclude further consideration of these alternatives over the 20 year 201 planning period as no additional capacity will be available.

Municipal Wastewater Management Alternatives - Southern Utah County and Northern Juab County

For purposes of this Study, Southern Utah County and Northern Juab County include the communities of Santaquin, Goshen, Elberta, Mona, and Nephi. At the present time, only Nephi collects and treats sewage. No alternative wastewater management plans were developed for the area because the communities are small and consolidation and/or conveyance of wastewater out of the area is clearly uneconomical.

The Plan recommends continued use of septic tank systems where feasible and continued use of wastewater lagoons at Nephi.

Other Municipal Wastewater Management Alternatives

Notwithstanding the numerous alternative facility configurations presented and discussed in the foregoing, two other possible wastewater management options were considered for the Study Area. Wastewater reclamation and reuse was summarily dismissed as uneconomical because of the availability of water from other sources, particularly the Central Utah Project. However, it was indicated that future demand for imported water created by future energy development may alter this conclusion. In the event this occurs, many of the physical configurations considered retain the option to go to reclamation and reuse in the future.

Land disposal of treated municipal wastewater was also dismissed from serious consideration except for Alternative 4 for Wasatch County. Reasons offered included the high groundwater table, proximity of treatment plants to developed areas, and the long period of frost. Land disposal is being further evaluated within the context of the ongoing 208 Programs.

No Action Alternative

The "no action" alternative was not seriously considered in the Plan nor in this report. Existing water quality problems, significant infiltration in some systems, currently overloaded or near-capacity facilities, and projected significant development are all substantial reasons for implementing some wastewater treatment strategy. Without a minimum of effort to expand and upgrade treatment facilities to secondary treatment levels, existing water quality can be expected to be significantly degraded as a result of future development and population growth.

TABLE III-10
MUNICIPAL WASTEWATER MANAGEMENT ALTERNATIVES - OVERALL UTAH AND WASATCH COUNTIES

Alternative	Treatment Facility	Treatment Level <u>III</u> IV	Discharge to Utah Lake	Abandon/Connect To
OU/WC-1	Lehi	→	→	New Provo - Level IV - Bay
	American Fork	→	→	New Provo - Level IV - Bay
	Pleasant Grove	→	→	New Provo - Level IV - Bay
	Orem	→	→	New Provo - Level IV - Bay
	Provo	→	→	New Provo - Level IV - Bay
	Springville	→	→	New Provo - Level IV - Bay
	Spanish Fork	→	→	New Provo - Level IV - Bay
	Salem	→	→	New Provo - Level IV - Bay
	Payson	→	→	New Provo - Level IV - Bay
	Midway	→	→	New Provo - Level IV - Bay
	Heber	→	→	New Provo - Level IV - Bay
OU/WC-2	Lehi	→	→	New Provo - Level III - Bay
	American Fork	→	→	New Provo - Level III - Bay
	Pleasant Grove	→	→	New Provo - Level III - Bay
	Orem	→	→	New Provo - Level III - Bay
	Provo	→	→	New Provo - Level III - Bay
	Springville	→	→	New Provo - Level III - Bay
	Spanish Fork	→	→	New Provo - Level III - Bay
	Salem	→	→	New Provo - Level III - Bay
	Payson	→	→	New Provo - Level III - Bay
	Midway	→	→	New Provo - Level III - Bay
	Heber	→	→	New Provo - Level III - Bay
		Not Considered		
		Not Considered		

TABLE III-10 (Continued)

MUNICIPAL WASTEWATER MANAGEMENT ALTERNATIVES - OVERALL UTAH AND WASATCH COUNTIES

Alternative	Treatment Facility	Treatment Level <u>III</u> IV	Discharge to Utah Lake	Abandon/Connect To
OU/WC-3	Lehi		→	New Provo - Level III - Lake
	American Fork		→	New Provo - Level III - Lake
	Pleasant Grove		→	New Provo - Level III - Lake
	Orem		→	New Provo - Level III - Lake
	Provo		→	New Provo - Level III - Lake
	Springville		→	New Provo - Level III - Lake
	Spanish Fork		→	New Provo - Level III - Lake
	Salem		→	New Provo - Level III - Lake
	Payson		→	New Provo - Level III - Lake
	Midway		→	New Provo - Level III - Lake
	Heber		→	New Provo - Level III - Lake
		Not Considered		
		Not Considered		
OU/WC-4	Lehi		→	New Provo - Level IV - Bay
	American Fork		→	New Provo - Level IV - Bay
	Pleasant Grove		→	New Provo - Level IV - Bay
	Orem		→	New Provo - Level IV - Bay
	Provo		→	New Provo - Level IV - Bay
	Springville		→	New Provo - Level IV - Bay
	Spanish Fork		→	New Provo - Level IV - Bay
	Salem		→	New Provo - Level IV - Bay
	Payson		→	New Provo - Level IV - Bay
	Midway		→	New Provo - Level IV - Bay
	Heber		→	New Provo - Level IV - Bay

TABLE III-10 (Continued)
MUNICIPAL WASTEWATER MANAGEMENT ALTERNATIVES - OVERALL UTAH AND WASATCH COUNTIES

<u>Alternative</u>	<u>Treatment Facility</u>	<u>Treatment Level</u> III IV	<u>Discharge to</u> <u>Utah Lake</u>	<u>Abandon/Connect To</u>	
OU/WC-5	Lehi	→	→	New Provo	Level III - Bay
	American Fork	→	→	New Provo	Level III - Bay
	Pleasant Grove	→	→	New Provo	Level III - Bay
	Orem	→	→	New Provo	Level III - Bay
	Provo	→	→	New Provo	Level III - Bay
	Springville	→	→	New Provo	Level III - Bay
	Spanish Fork	→	→	New Provo	Level III - Bay
	Salem	→	→	New Provo	Level III - Bay
	Payson	→	→	New Provo	Level III - Bay
	Midway	→	→	New Provo	Level III - Bay
	Heber	→	→	New Provo	Level III - Bay
		→	→		
		→	→		
OU/WC-6	Lehi	→	→	New Provo	Level III - Lake
	American Fork	→	→	New Provo	Level III - Lake
	Pleasant Grove	→	→	New Provo	Level III - Lake
	Orem	→	→	New Provo	Level III - Lake
	Provo	→	→	New Provo	Level III - Lake
	Springville	→	→	New Provo	Level III - Lake
	Spanish Fork	→	→	New Provo	Level III - Lake
	Salem	→	→	New Provo	Level III - Lake
	Payson	→	→	New Provo	Level III - Lake
	Midway	→	→	New Provo	Level III - Lake
	Heber	→	→	New Provo	Level III - Lake
		→	→		
		→	→		

FIGURE III-9

WASTEWATER TREATMENT ALTERNATIVES
OVERALL UTAH AND WASATCH COUNTIES

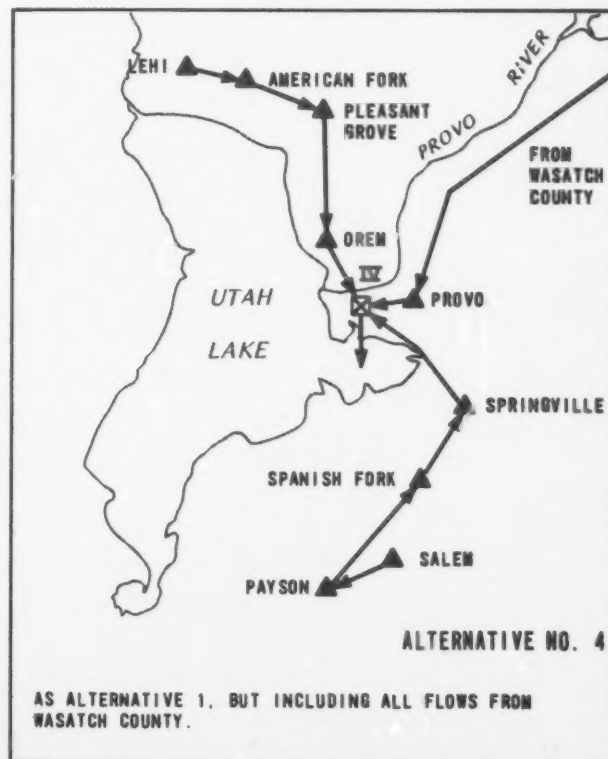
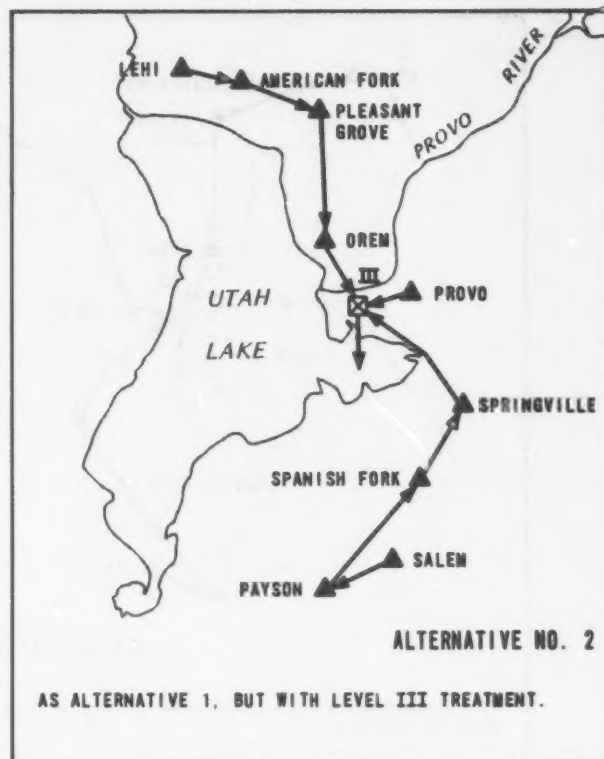
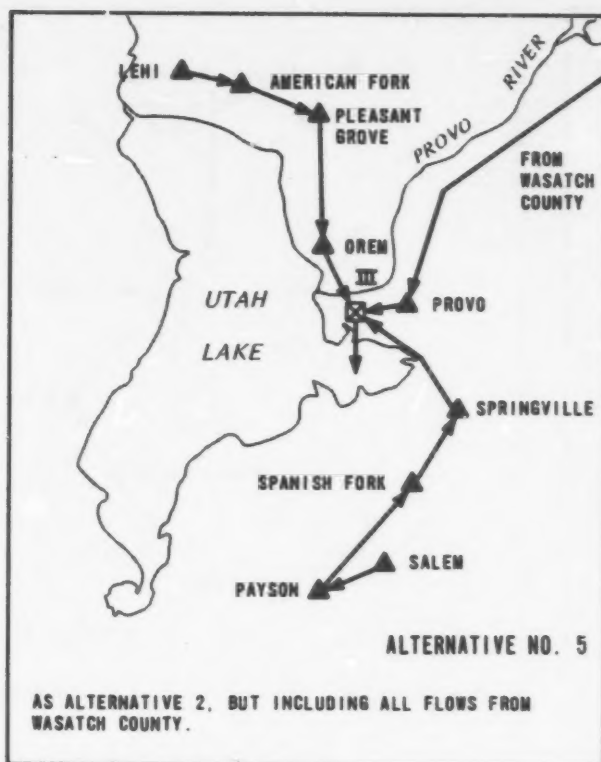


FIGURE III-9 (Continued)

WASTEWATER TREATMENT ALTERNATIVES
OVERALL UTAH AND WASATCH COUNTIES



CHAPTER IV

WATER QUALITY IMPACTS

INTRODUCTION

As discussed in Chapter III, the Study Area was divided into planning areas for purposes of estimating wastewater loads and treatment needs. Alternative wastewater management strategies were then developed for aggregations of these planning areas and treatment plants. Seven sub-basin areas were defined and the alternatives for each discussed in Chapter III. These sub-basin areas and associated treatment plants are:

- . Davis County (DC) comprised of the North Davis, Central Davis, and South Davis Planning Areas served by the following treatment plants:
 - .. North Davis
 - .. Central Davis
 - .. South Davis North
 - .. South Davis South
- . Salt Lake County (SLC) comprised of the Salt Lake City, South Salt Lake, Murray-Cottonwood, and Tri-Community/Sandy Planning Areas served by the following treatment plants:
 - .. Salt Lake City
 - .. South Salt Lake
 - .. Granger-Hunter
 - .. Salt Lake City Suburban Sanitation District No. 1
 - .. Murray
 - .. Salt Lake County - Cottonwood
 - .. Tri-Community
 - .. Sandy
- . Magna Area (MA) consisting of the Magna Planning Area served by the Magna wastewater treatment facility.
- . Northern Utah County (NUC) consisting of the American Fork Planning Area served by the following treatment plants:
 - .. Lehi
 - .. American Fork
 - .. Pleasant Grove
 - .. Orem
- . Central Utah County (CUC) comprised of the Provo, Springville, Spanish Fork, and Payson Planning Areas served by the following wastewater treatment plants:
 - .. Provo
 - .. Springville
 - .. Spanish Fork
 - .. Salem
 - .. Payson
- . Wasatch County (WC) consisting of the Heber Valley Planning Area served by the Heber and Midway treatment plants.
- . Overall Utah and Wasatch Counties (OU/WC) comprised of the planning areas for Northern Utah County, Central Utah County, and Wasatch County and served by the wastewater treatment facilities in each area. These alternatives are not discussed

herein because of the commitments being made for upgrading and expanding the Provo wastewater treatment facility as discussed in Chapter III.

The water quality impacts associated with the sub-area alternatives are analyzed in terms of the economics, waste load reductions, and impacts on aquatic ecology. Economic impacts are defined in terms of the total 1973 capital (construction) costs, annual operation and maintenance costs, and the total annual cost per person connected to each system. Total annual costs were derived by amortizing the capital cost of treatment facilities at seven percent for 20 years and the capital cost of interceptors at seven percent for 60 years and adding annual operation and maintenance cost. Total annual costs were then divided by the median population between existing conditions and the 1995 projections for each facility as presented in Table IV-1. The resultant annual cost per capita is intended to reflect an "average" cost over the life of the facility and does not reflect "actual" cost per capita, nor does this value recognize the potential for 75 percent Federal funding for capital cost.

Estimates of waste load reductions are made for each sub-area with the exception of Salt Lake County where mathematical modelling efforts make in place water quality evaluation possible. Waste load reductions are derived by estimating the non-point (runoff) and point (wastewater treatment plant and industrial effluents) pollutant loadings for Biochemical Oxygen Demand (BOD), Total Dissolved Solids (TDS), Total Nitrogen (TN), Phosphates (PO_4), and Total Suspended Solids (TSS) in each sub-area (see Chapter II for an explanation of these parameters). The point source loadings were estimated by converting the estimated flows to pounds of parameter discharged using the estimated effluent concentrations presented in Table III-4. Non-point source loadings were estimated by multiplying the future land use areas in acres by average parameter loading coefficients expressed in pounds per acre per year. These coefficients were developed from local data and data from similar areas where local data was missing. The potential effects of non-point source controls, as being currently investigated by the 208 Programs, are not considered in these estimated non-point loadings. This approach was taken because it is impossible to tell what types of non-point controls are feasible at this time and what their effect might be.

The impacts of the aquatic ecology of each area are evaluated in terms of the identified species in each area. Because of the impossibility of assessing in place water quality, these impacts are more qualitative than quantitative.

The water quality impacts of all physical system alternatives for each sub-area are presented in the following sections. A general discussion of the legal implications follows these sub-area presentations.

The following analysis does not include a discussion of coliform loadings nor ammonia loadings. These two parameters are important to any evaluation of water quality impacts but the lack of any coliform or ammonia data for non-point sources precludes any analysis. Suffice it to say that the effluent criteria for total coliforms specified for Level III and Level IV treatment, 2.2 MPN/100 ml, and the inclusion of nitrification in the unit processes for these treatment levels will act to reduce coliform and ammonia levels from point discharges in the future.

DAVIS COUNTY

The wastewater treatment facilities alternatives for Davis County are illustrated in Figure IV-1. For purposes of evaluation, the alternatives have been aggregated into three categories:

TABLE IV-1
EXISTING, 1995, AND MEDIAN POPULATIONS

<u>Facility</u>	<u>Existing</u>	<u>Populations</u>	
		<u>1995</u>	<u>Median</u>
North Davis	70,850	127,800	99,300
Central Davis	10,675	32,500	21,600
South Davis North	37,860	57,700	47,800
South Davis South	14,730	23,000	18,900
Salt Lake City	175,320	242,350	208,800
Magna	7,052	18,500	12,800
South Salt Lake	9,300	26,726	18,000
Granger-Hunter	72,583	119,755	96,200
SLC - SSD #1	120,352	160,326	140,300
Cottonwood	48,561	77,462	63,000
Murray	24,980	48,000	36,500
Tri-Community	30,000	47,700	38,800
Sandy	20,113	26,682	23,400
Lehi	4,800	8,179	6,500
American Fork	11,000	12,759	11,900
Pleasant Grove	6,000	8,328	7,200
Orem	28,400	63,521	46,000
Heber	3,050	6,700	4,900
Midway	1,095	2,215	1,700
Provo	63,500	78,689	71,100
Springville	8,400	18,893	13,600
Spanish Fork	7,700	12,970	10,300
Salem	1,200	1,661	1,400
Payson	5,180	6,889	6,000

FIGURE IV-1
WASTEWATER TREATMENT ALTERNATIVES - DAVIS COUNTY

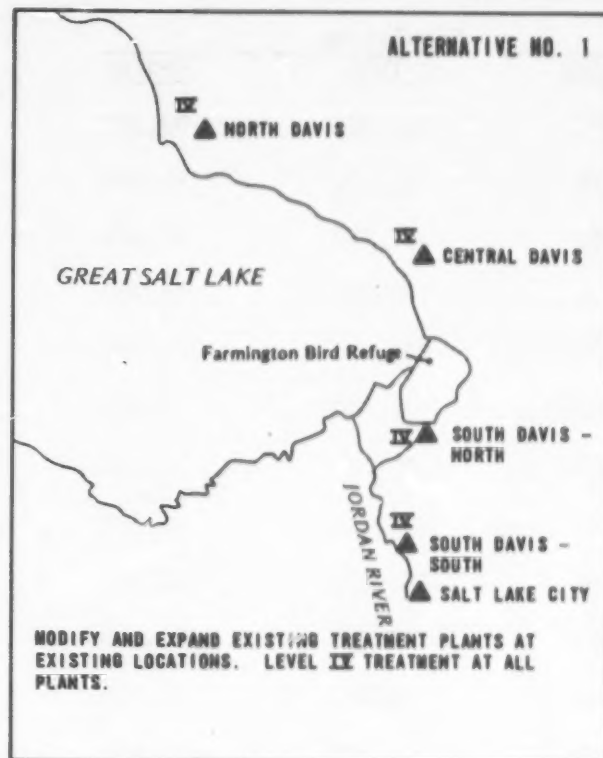


FIGURE IV-1 (Continued)

WASTEWATER TREATMENT ALTERNATIVES - DAVIS COUNTY

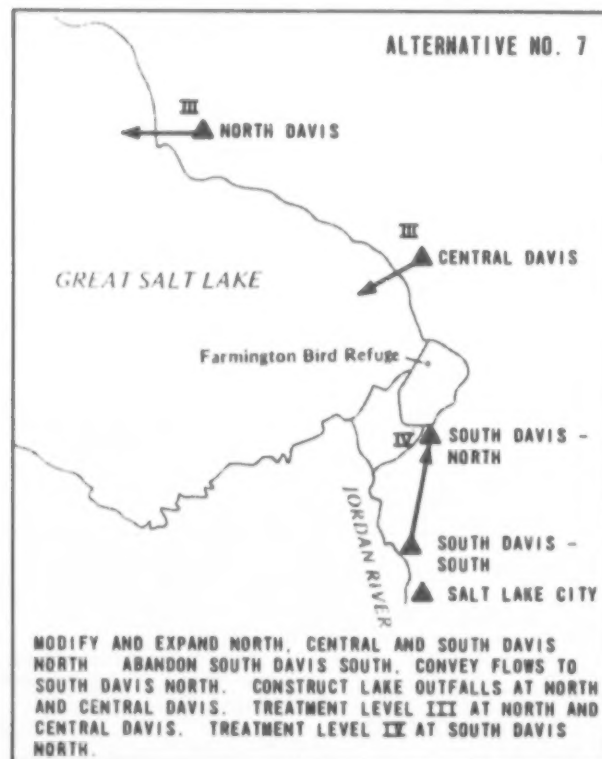


FIGURE IV-1 (Continued)
WASTEWATER TREATMENT ALTERNATIVES - DAVIS COUNTY

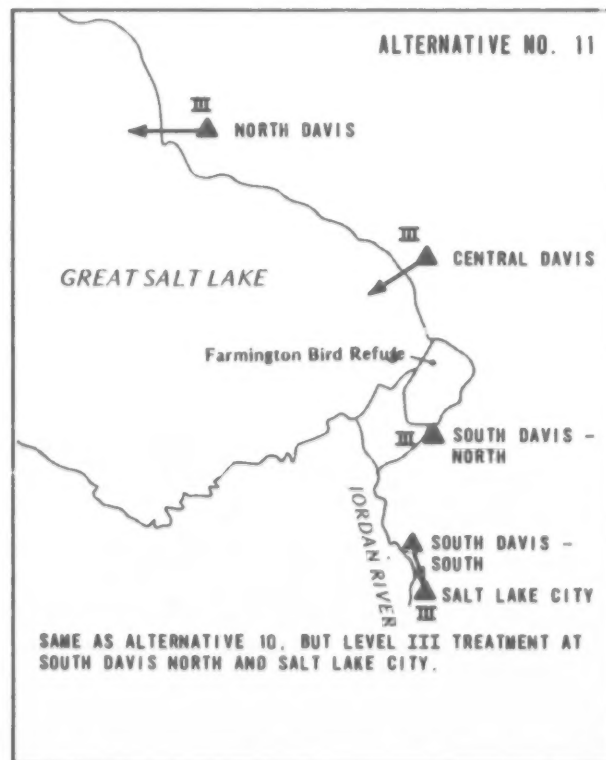
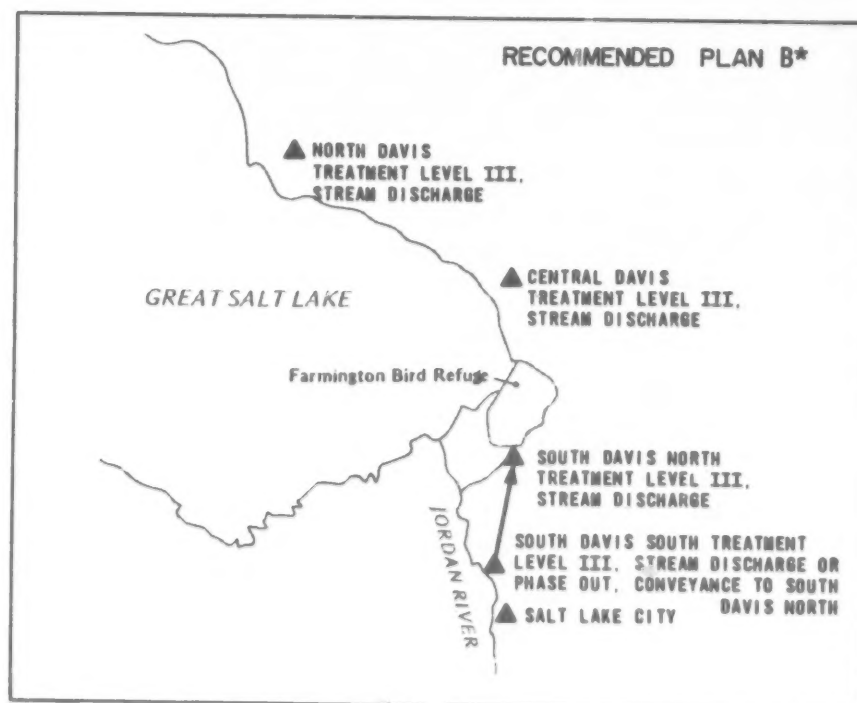


FIGURE IV-1 (Continued)
WASTEWATER TREATMENT ALTERNATIVES - DAVIS COUNTY



*RECOMMENDED PLAN A IS SHOWN AS ALTERNATIVE DC-2

- . all plants at Level III treatment
- . all plants at Level IV treatment
- . a combination of Level III and Level IV treatment plants.

Alternatives including only Level III treatment are DC-2, DC-4, DC-6, DC-8, DC-9, DC-11, DC-13 and the recommended plan. Only one alternative, DC-1, requires all plants at Level IV. The remaining alternatives include the North Davis and Central Davis facilities at Level III and the two South Davis facilities at Level IV.

Cost Analysis

The cost of wastewater treatment alternatives for Davis County are presented in Table IV-2. The costs associated with these alternatives range from \$8.55/cap/year for DC-13 to \$16.63/cap/year for DC-5. The alternatives with all facilities at Level III treatment are generally more economical than those at Level IV or a combination of Level III and Level IV. The recommended plan is among the more economical of alternatives at \$10.87/cap/year and the most economical of all the alternatives which do not include a connection to the Salt Lake City Plant. If secondary treatment were implemented for the recommended plan instead of Level III treatment, costs could be reduced to \$4.21/cap/year.

Waste Load Analysis

Waste loads associated with the various wastewater treatment alternatives are illustrated in Figures IV-2 to IV-6. Each bar on the figures can be comprised of three sections summing to the total estimated waste load. The bottom portion of the bar represents the anticipated non-point source loading. The middle portion reflects point sources and the top area represents any point source loading exported to another area such as alternatives DC-10 through DC-13 where a portion of the waste load is transported to the Salt Lake City plant.

Non-point sources appear to be significant sources of BOD, TSS, and TDS in Davis County. In contrast, PO_4 and TN are derived mostly from point sources. The non-point source portion of total waste loadings for all parameters considered does not change among treatment alternatives because all alternatives are based on the same land use plan. The point sources portion of total waste loadings does not change among alternatives for TDS and TN because these parameters are unaffected by Level III and Level IV treatment processes. Likewise, changes among alternatives in point source TSS loadings are imperceptible because they represent less than one percent of total waste loadings.

As illustrated in Figure IV-2, total BOD loading is least for Alternative DC-1 (Level IV treatment). However, this is only 15 percent less than any Level III treatment alternative. In contrast, if secondary treatment was implemented with the recommended plan, the future BOD loading would be 75 percent greater than the existing condition and 53 percent greater than with Level III treatment.

The PO_4 loadings illustrated in Figure IV-4 reflect characteristics similar to the BOD loadings. The Level IV treatment alternative, DC-1, results in the smallest PO_4 loading, but not significantly less (12 percent) than any Level III alternative. The recommended plan with secondary treatment results in a 60 percent increase in PO_4 loading over existing conditions.

TABLE IV-2
COST ANALYSIS FOR DAVIS COUNTY

<u>Categories of Alternatives</u>	<u>Capital Cost (\$106)</u>	<u>Annual Operation & Maintenance Cost (\$106/Yr)</u>	<u>Annual Cost¹ Per Capita (\$/Cap/Yr)</u>
<u>Level III Alternatives</u>			
DC-2 (Recommended Plan A)	9.55	1.17	11.14
DC-4	14.24	1.19	13.01
DC-6	16.31	1.05	13.11
DC-8	15.04	1.09	12.74
DC-9	19.79	1.01	14.07
DC-11	19.22	1.85	8.96
DC-13	19.18	1.74	8.55
<u>Level IV Alternatives</u>			
DC-1	23.77	1.74	21.22
<u>Levels III & IV Alternatives</u>			
DC-3	19.39	1.37	16.52
DC-5	21.46	1.23	16.63
DC-7	19.74	1.26	15.99
DC-10	33.75	2.59	14.25
DC-12	32.18	2.49	13.55
<u>Recommended Plan B</u>			
Level III	10.35	1.07	10.87
Secondary	3.22	0.51	4.21

¹Annual Cost per Capita is for comparison among alternatives only. They were derived by dividing the total annual cost by the median population between existing conditions and 1995 (Table IV-1). These data are intended to reflect an average cost over the life of the facility and do not represent actual cost per capita nor is the potential for 75 percent Federal funding reflected.

FIGURE IV-2
BOD WASTE LOADS - DAVIS COUNTY

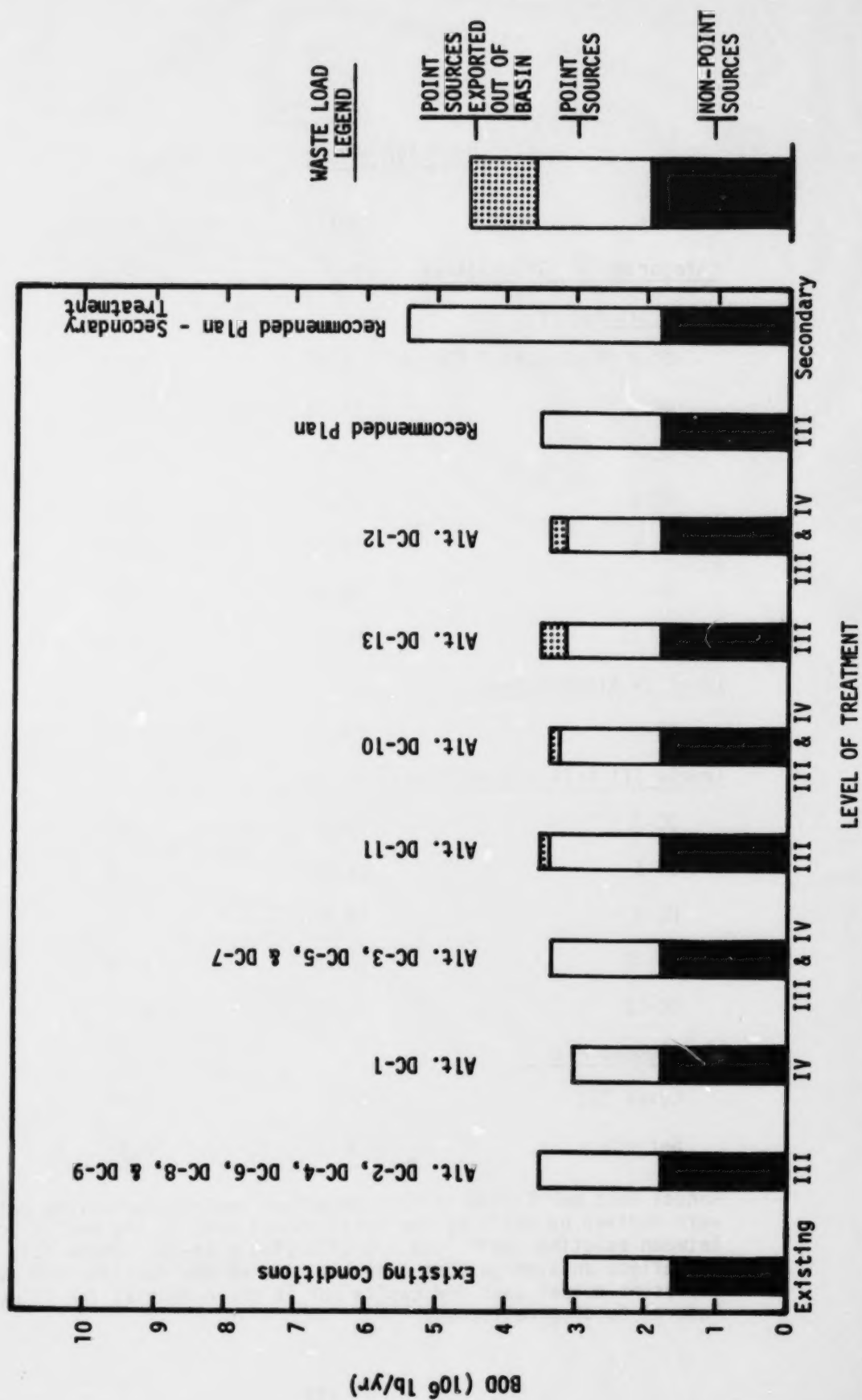


FIGURE IV-3

TDS WASTE LOADS - DAVIS COUNTY

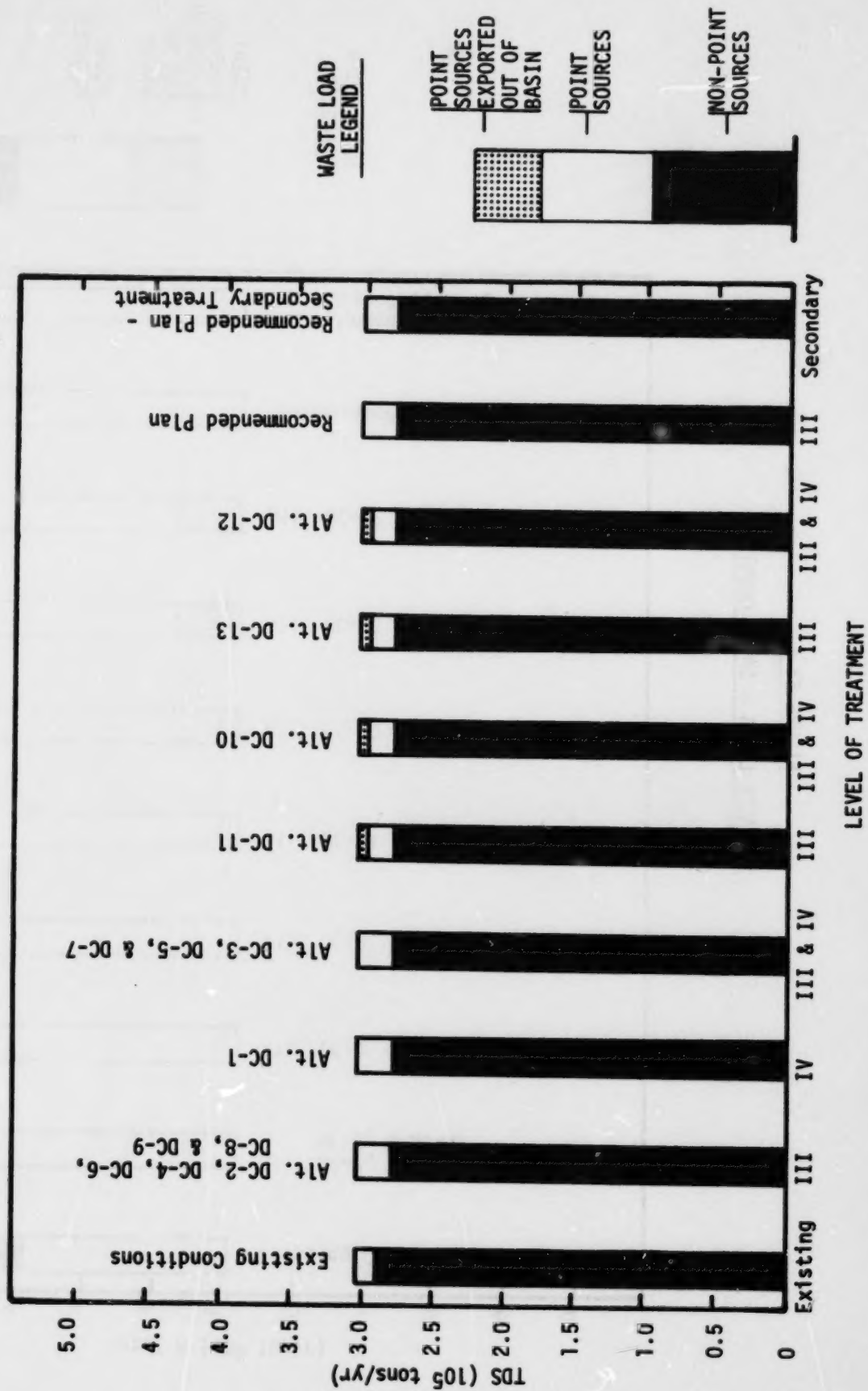


FIGURE IV-4
TN WASTE LOADS - DAVIS COUNTY

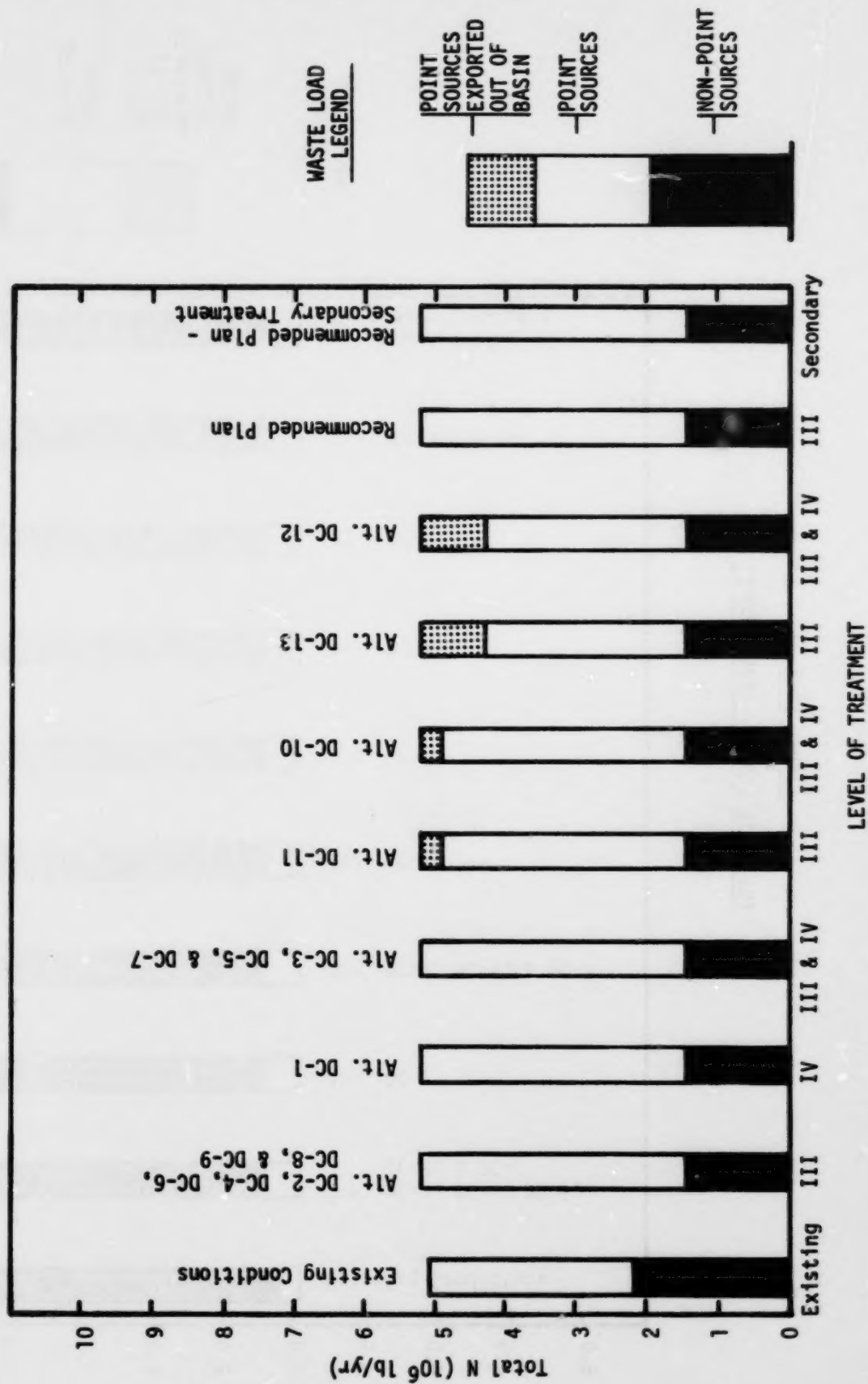


FIGURE IV-5
P04 WASTE LOADS - DAVIS COUNTY

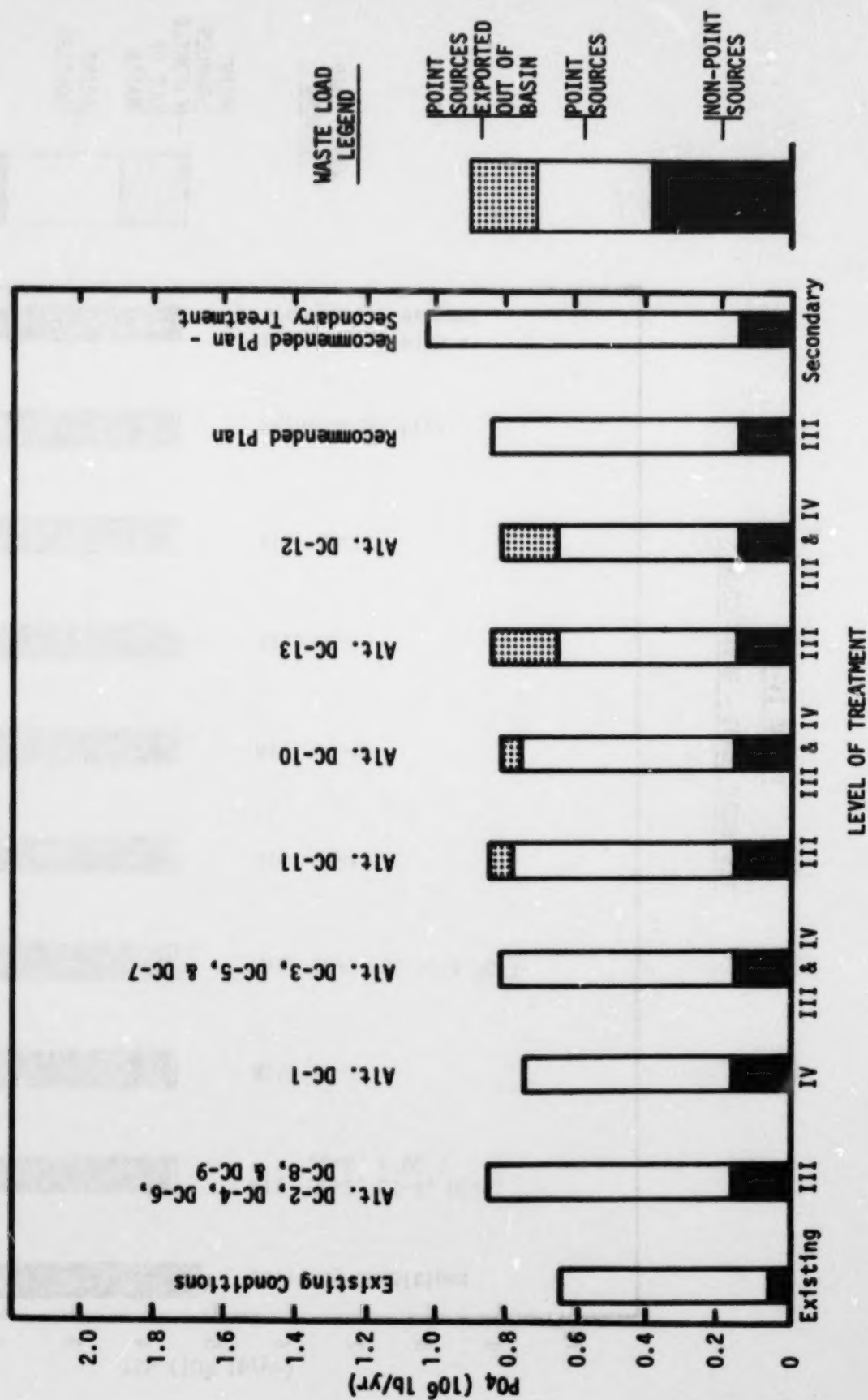
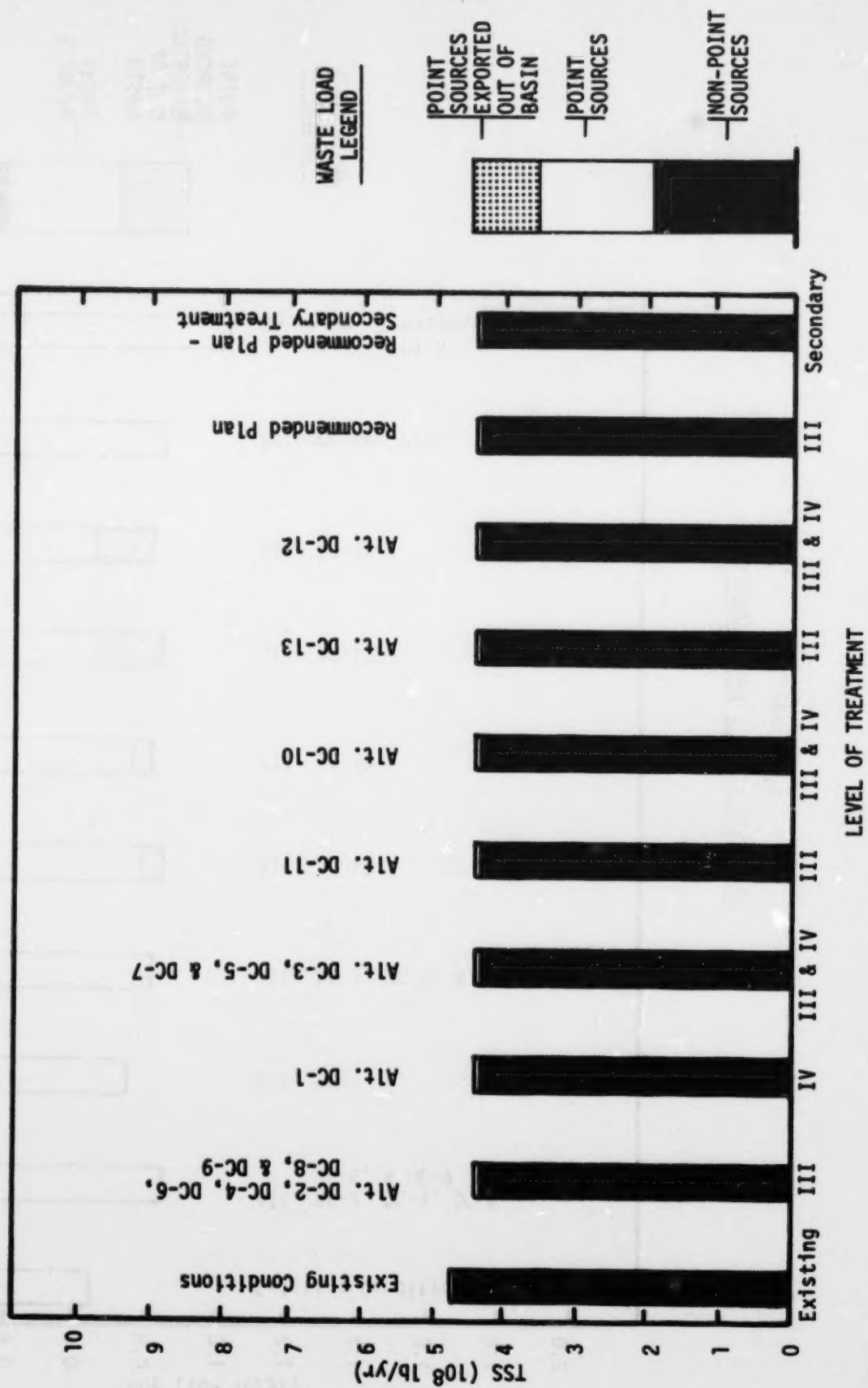


FIGURE IV-6
TSS WASTE LOADS - DAVIS COUNTY



Coliform bacteria loadings are not illustrated, but any alternative can be expected to reduce bacterial contamination from point sources over existing conditions because of strict effluent limitations on coliform bacteria for all levels of treatment considered. See Table III-4 for a comparison of estimated coliform effluent quality for secondary, Level III, and Level IV treatment levels.

Aquatic Impact

The ultimate receiving environment for Davis County wastewater treatment plant effluents is Farmington Bay and Great Salt Lake. The extremely saline environment of Great Salt Lake limits aquatic life to protozoa, brine shrimp, eleven species of bacteria, and four species of algae. A direct effect of Great Salt Lake's high salinity content is to kill most bacteria hence reducing the potential for oxygen depletion and health hazards. Additionally, there is a limited algal population to assimilate nutrients, thus aesthetic problems associated with algal blooms and subsequent oxygen depletion may be limited. However, sewage effluents do present a potential for oxygen depletion and health hazards in the streams and marsh areas before reaching the Lake or in formation of "fresh water lenses" in the Lake because of density differences.

The seven mile long causeway to the northern tip of Antelope Island has effectively cut off Farmington Bay from the remainder of the Lake. This situation and the limited current information available to describe this unique aquatic ecosystem and its behavior to wastewater discharges makes further quantitative evaluation of ecosystem impact impossible. This issue is currently being studied by the ongoing 208 Programs.

Summary

Based on the previous discussion regarding costs, waste loads, and aquatic impacts resulting from the Davis County wastewater treatment strategies, the following observations can be made:

- . At Level III treatment, Alternative DC-13 is the most economical facility plan.
- . Ignoring the cost of the Salt Lake City facility, at combined Level III and Level IV treatment, Alternative DC-12 is least expensive.
- . The recommended plan with secondary treatment has an associated cost of only 40 percent of the recommended plan at Level III.
- . Non-point sources create significant BOD, TSS, and TDS waste loads.
- . No reduction in TDS, TN, or TSS will occur as a result of advanced treatment (Level III or IV) because TDS and TN are unaffected by treatment level and point source TSS loadings represent less than one percent of total TSS loadings.
- . No significant reduction in BOD or PO₄ results as one goes from Level III to Level IV treatment.
- . Because of the extremely saline nature of the Great Salt Lake, it is possible that no significant impact, either detrimental or beneficial, may be expected from discharging wastewater effluent of secondary, Level III or Level IV quality. However, the ongoing 208 Programs are analyzing this situation.

- . Based on modelling runs, decreases in BOD waste loads to the Jordan River from the South Davis South facility apparently have no direct effect on the dissolved oxygen concentration in the River.

SALT LAKE COUNTY

Salt Lake County as defined herein is comprised of all lands in Salt Lake County which directly drain to the Jordan River. This river system receives the majority of the waste loads directly or indirectly attributable to man's activity within the Study Area. Along the banks of the Jordan River are seven wastewater treatment plants and numerous industrial sources. In addition to these point source loadings, waste loads from non-point sources are also discharged to the River by way of irrigation return flows, canals, drains, and storm sewers.

Alternative wastewater treatment strategies considered for Salt Lake County are illustrated in Figure IV-7. For analysis of the water quality impacts, the alternatives are separated into two groups:

- . all plants at Level III treatment (SLC-2, SLC-4, SLC-8, SLC-9, SLC-10, SLC-11, and SLC-12).
- . all plants at Level IV treatment (SLC-1, SLC-3, SLC-5, SLC-6, and SLC-7).

The recommended plan is identical to the SLC-10 alternative.

Cost Analysis

Costs associated with alternative treatment strategies in Salt Lake County are presented in Table IV-3. The least expensive alternative in terms of annual per capita costs is SLC-10 or the recommended plan at \$8.66/cap/year. These plans with secondary treatment have an associated cost of only 54 percent of the plans at Level III. The recommended alternative takes advantage of economies of scale by consolidating treatment at the Salt Lake City and Suburban Sanitation District No. 1 facilities. Further consolidation to one plant at Salt Lake City does not provide additional economies because of the long interceptors required. If only Level IV treatment was considered, SLC-6 would be the most economical at \$15.58/cap/year.

Waste Load Analysis

Waste loads for Salt Lake County were developed for point and non-point sources and are illustrated in Figures IV-8 to IV-12. Non-point sources are and will be significant sources of BOD, Total Dissolved Solids (TDS), Total Nitrogen (TN), and Total Suspended Solids (TSS) waste loadings, contributing from 25 percent to 99 percent of the total waste loading. Future non-point source loadings do not vary among alternatives because all alternatives are based on the same land use plan.

Considering point sources, only BOD and Phosphate (PO₄) point loadings vary among future alternatives. TDS and TN are unaffected by Level III and Level IV treatment processes and Total Suspended Solids contributions from point sources are minimal (less than one percent of total waste loadings).

FIGURE IV-7

WASTEWATER TREATMENT ALTERNATIVES - SALT LAKE COUNTY

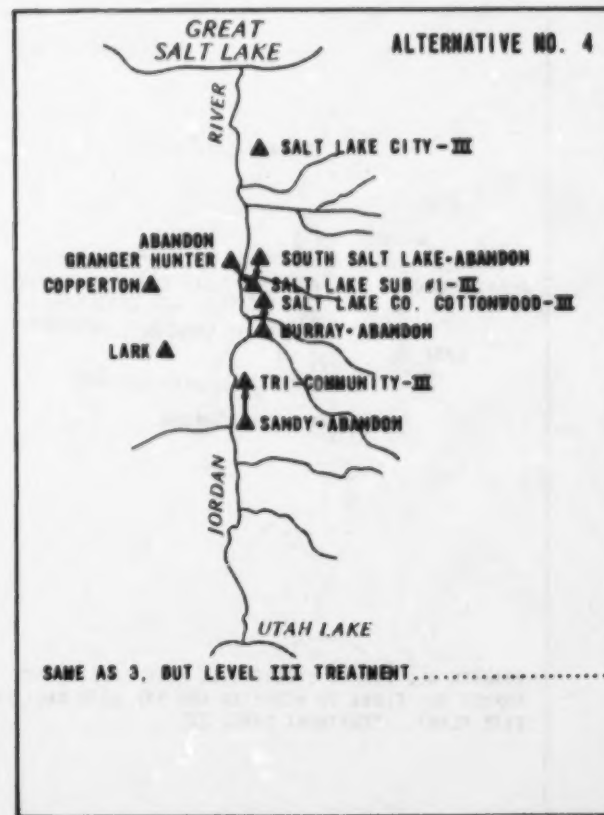
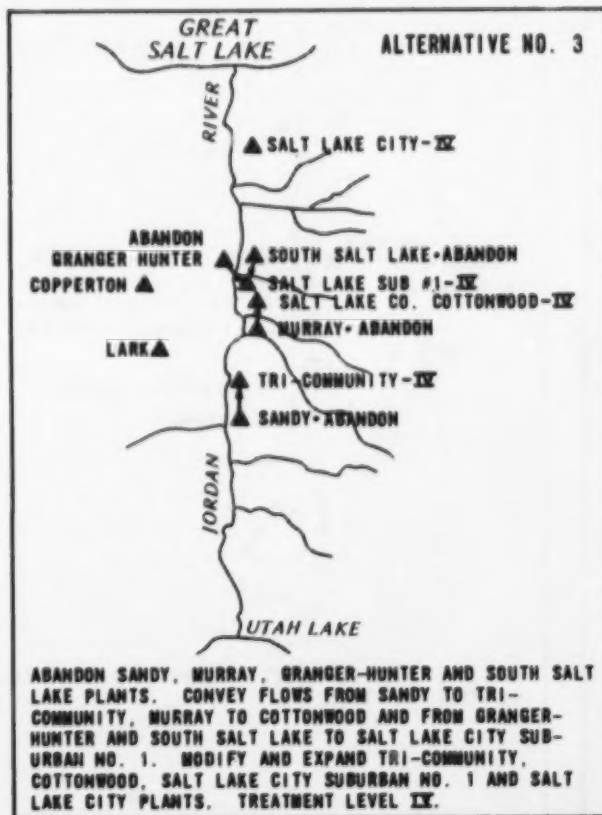
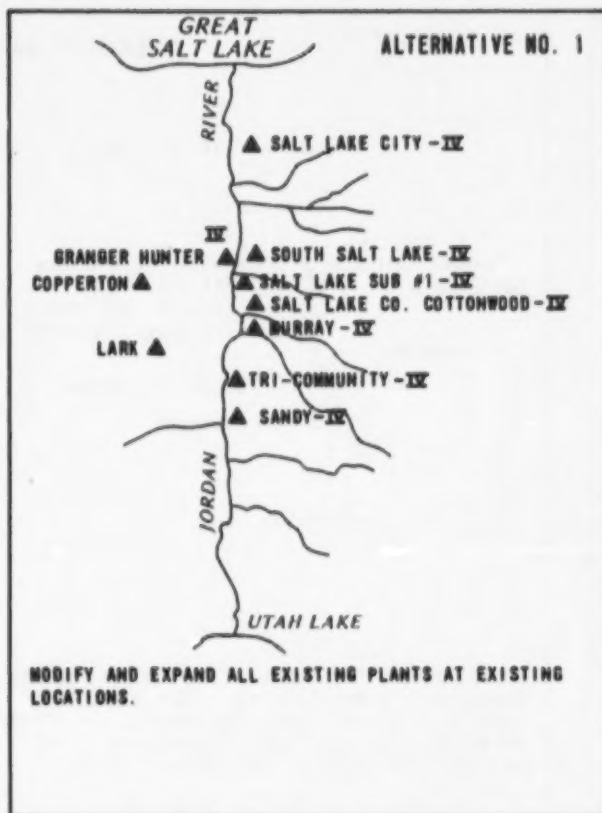


FIGURE IV-7 (Continued)

WASTEWATER TREATMENT ALTERNATIVES - SALT LAKE COUNTY

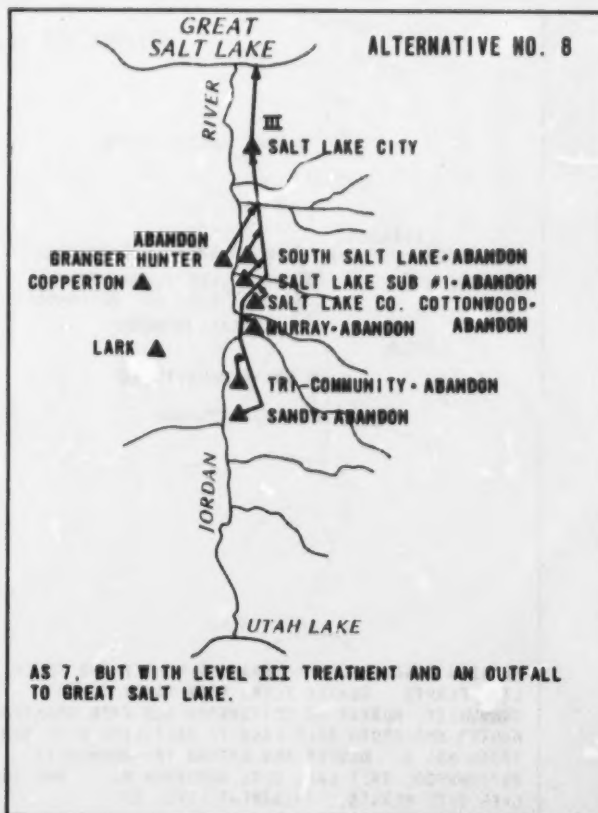
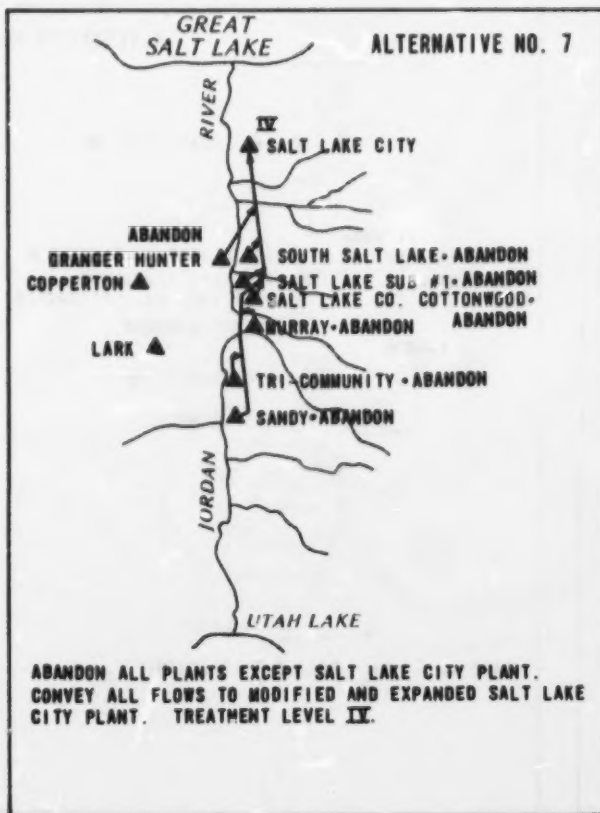
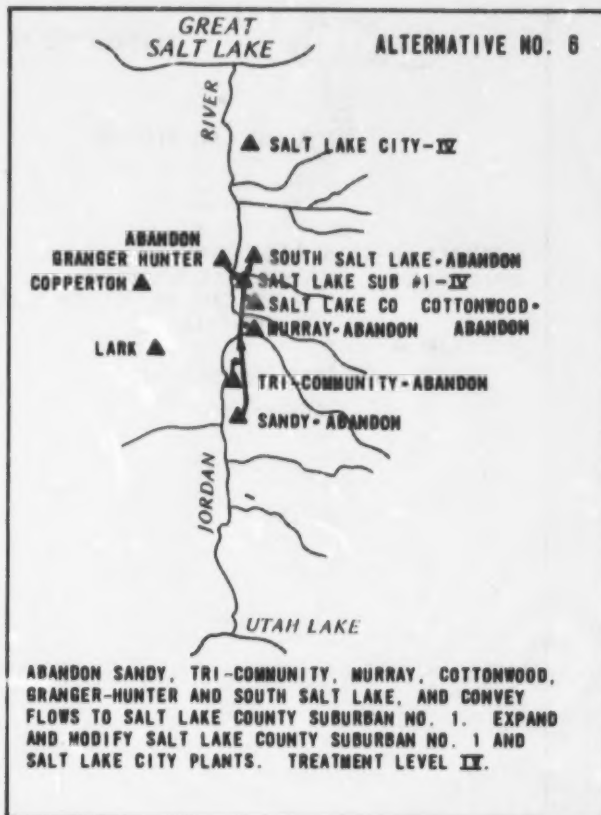
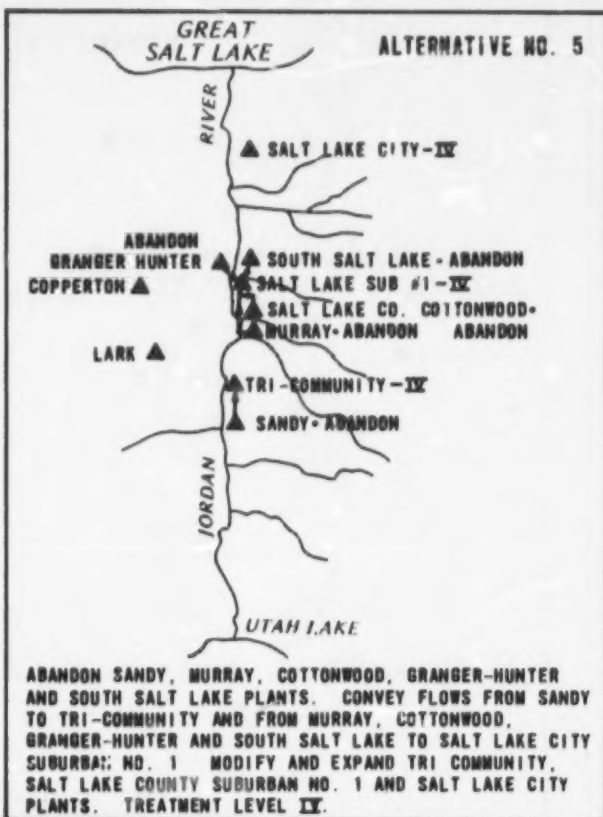


FIGURE IV-7 (Continued)
WASTEWATER TREATMENT ALTERNATIVES - SALT LAKE COUNTY

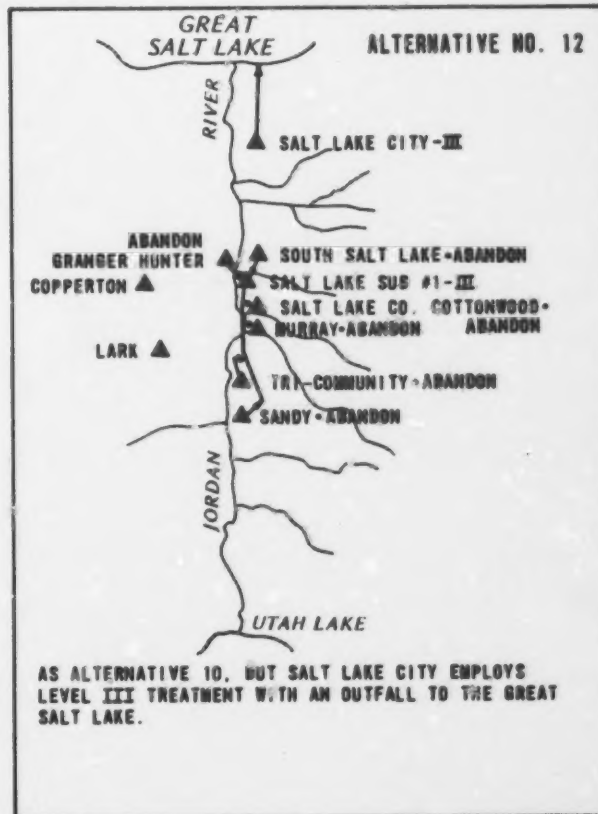
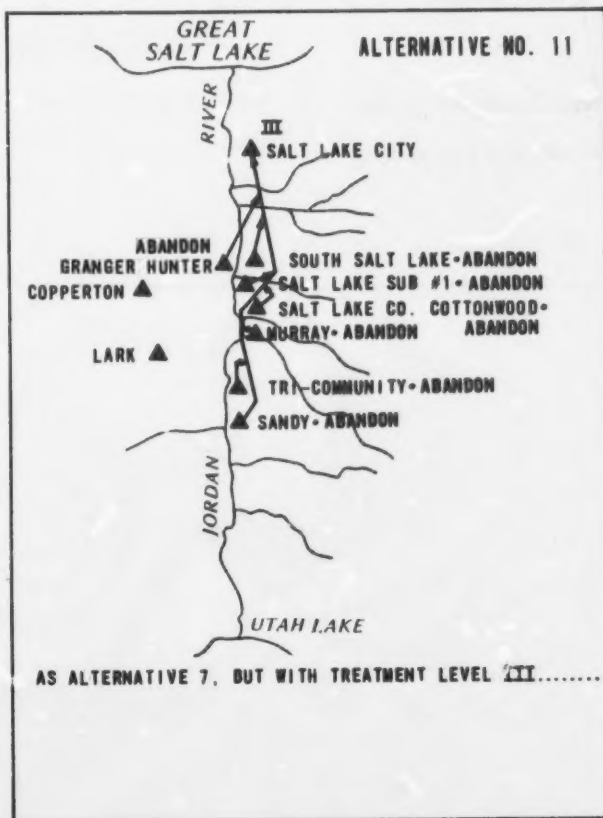
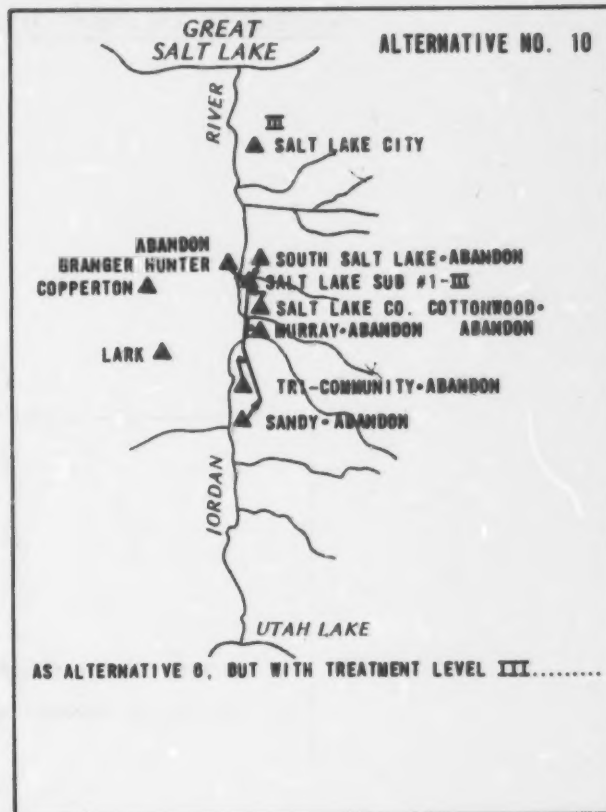
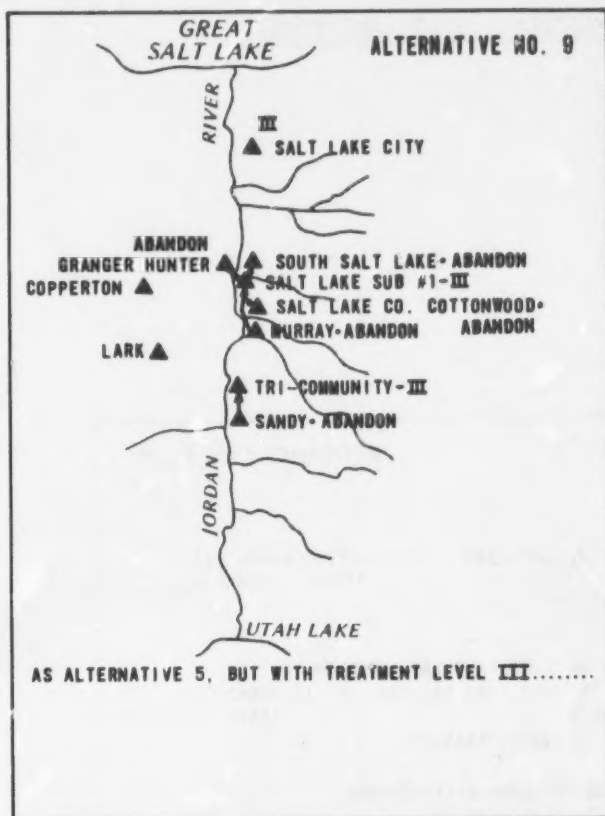


FIGURE IV-7 (Continued)

WASTEWATER TREATMENT ALTERNATIVES - SALT LAKE COUNTY

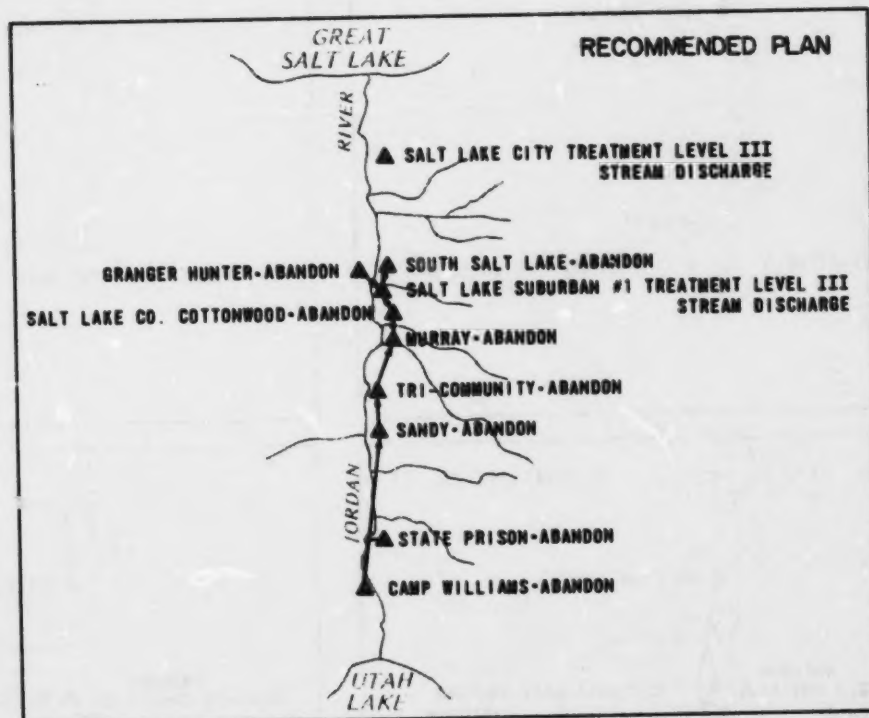


TABLE IV-3
COST ANALYSIS FOR SALT LAKE COUNTY

<u>Categories of Alternatives</u>	<u>Capital Cost (\$106)</u>	<u>Annual Operation & Maintenance Cost (\$106/Yr)</u>	<u>Annual Cost¹ Per Capita (\$/Cap/Yr)</u>
<u>Level III Alternatives</u>			
SLC-2	40.39	3.06	10.99
SLC-4	37.31	2.49	9.52
SLC-8	73.37	1.90	12.58
SLC-9	36.54	2.27	8.98
SLC-10	36.99	2.10	8.66
SLC-11	53.07	1.76	10.05
SLC-12	47.92	2.18	10.03
<u>Level IV Alternatives</u>			
SLC-1	79.60	4.82	19.74
SLC-3	70.66	4.23	17.36
SLC-5	67.04	4.02	16.40
SLC-6	64.59	3.83	15.58
SLC-7	76.07	3.46	16.24
<u>Recommended Plan</u>			
Level III	36.99	2.10	8.66
Secondary	21.79	1.07	4.70

¹Annual Cost per Capita is for comparison among alternatives only. They were derived by dividing the total annual cost by the median population between existing conditions and 1995 (Table IV-1). These data are intended to reflect an average cost over the life of the facility and do not represent actual cost per capita nor is the potential for 75 percent Federal funding reflected.

FIGURE IV-8

BOD WASTE LOADS - SALT LAKE COUNTY

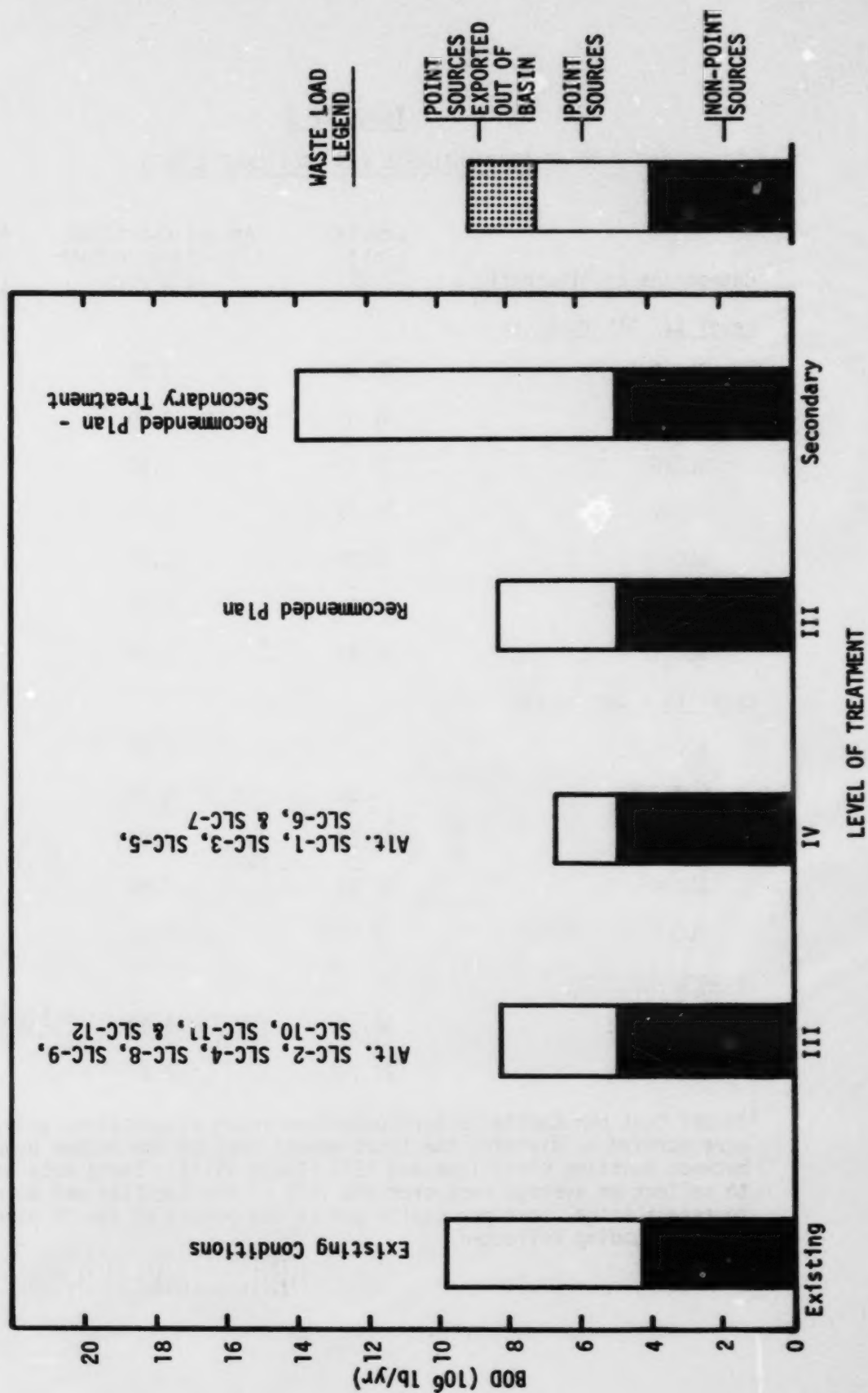


FIGURE IV-9

TDS WASTE LOADS - SALT LAKE COUNTY

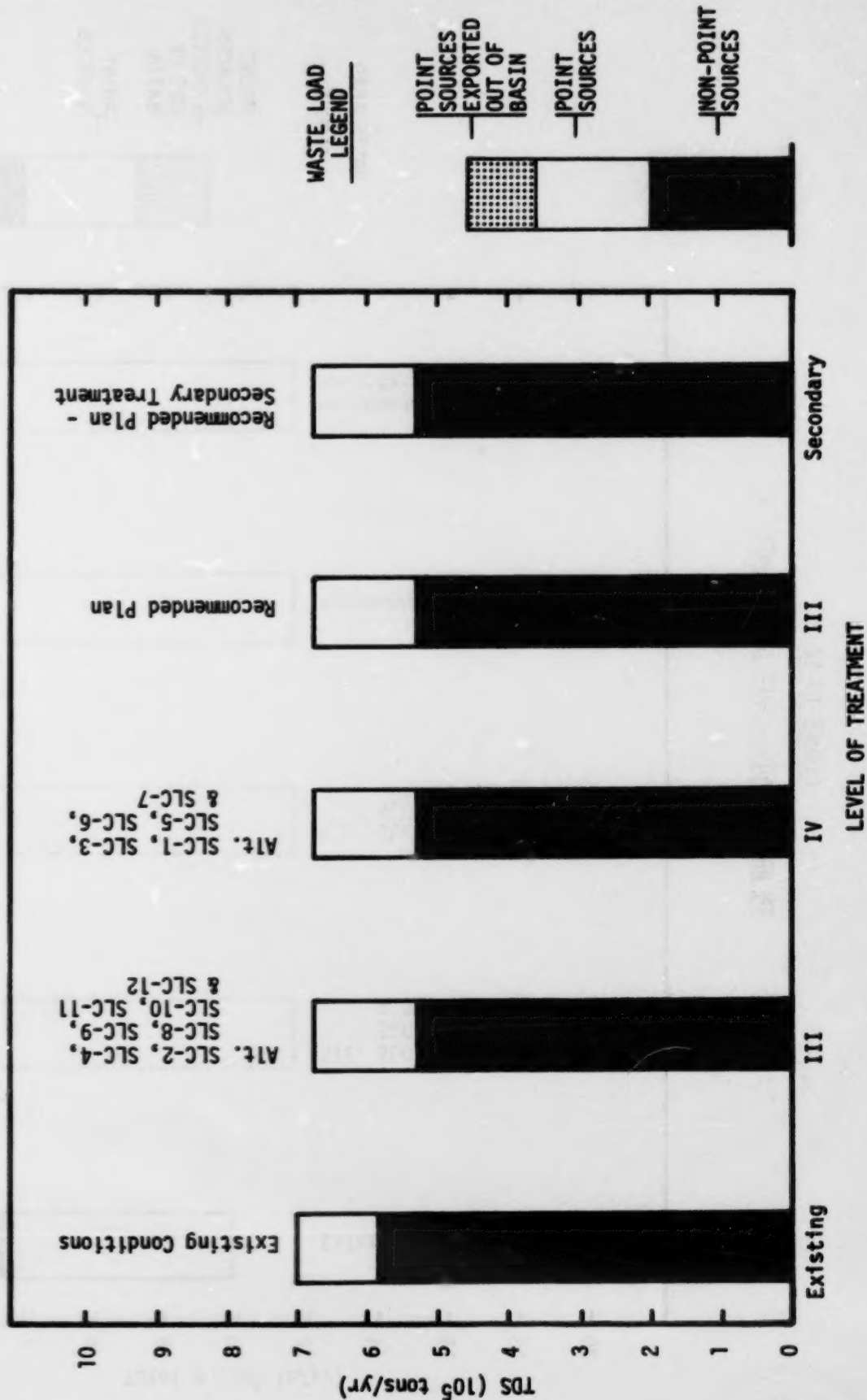


FIGURE IV-10
TN WASTE LOADS - SALT LAKE COUNTY

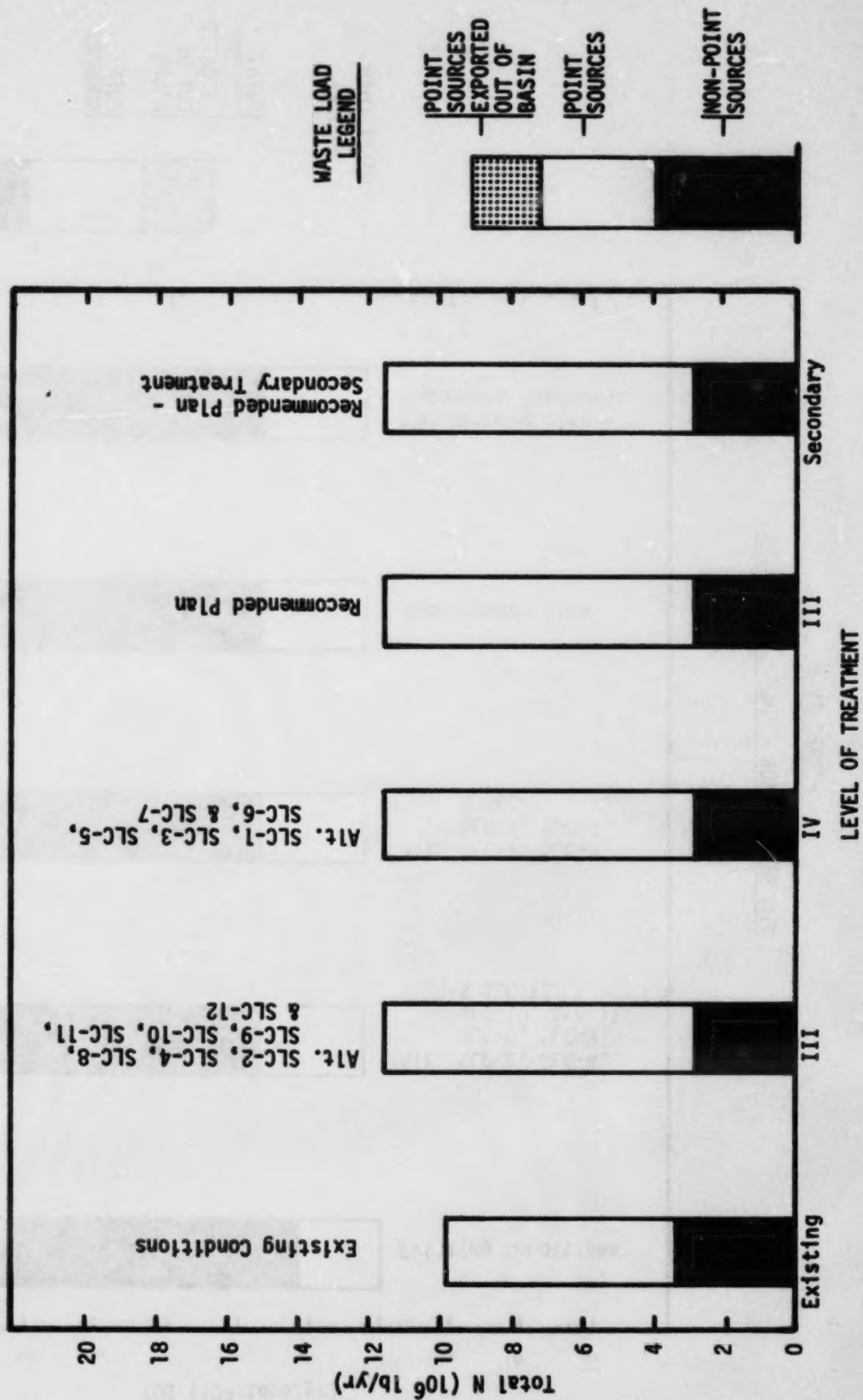


FIGURE IV-11

P04 WASTE LOADS - SALT LAKE COUNTY

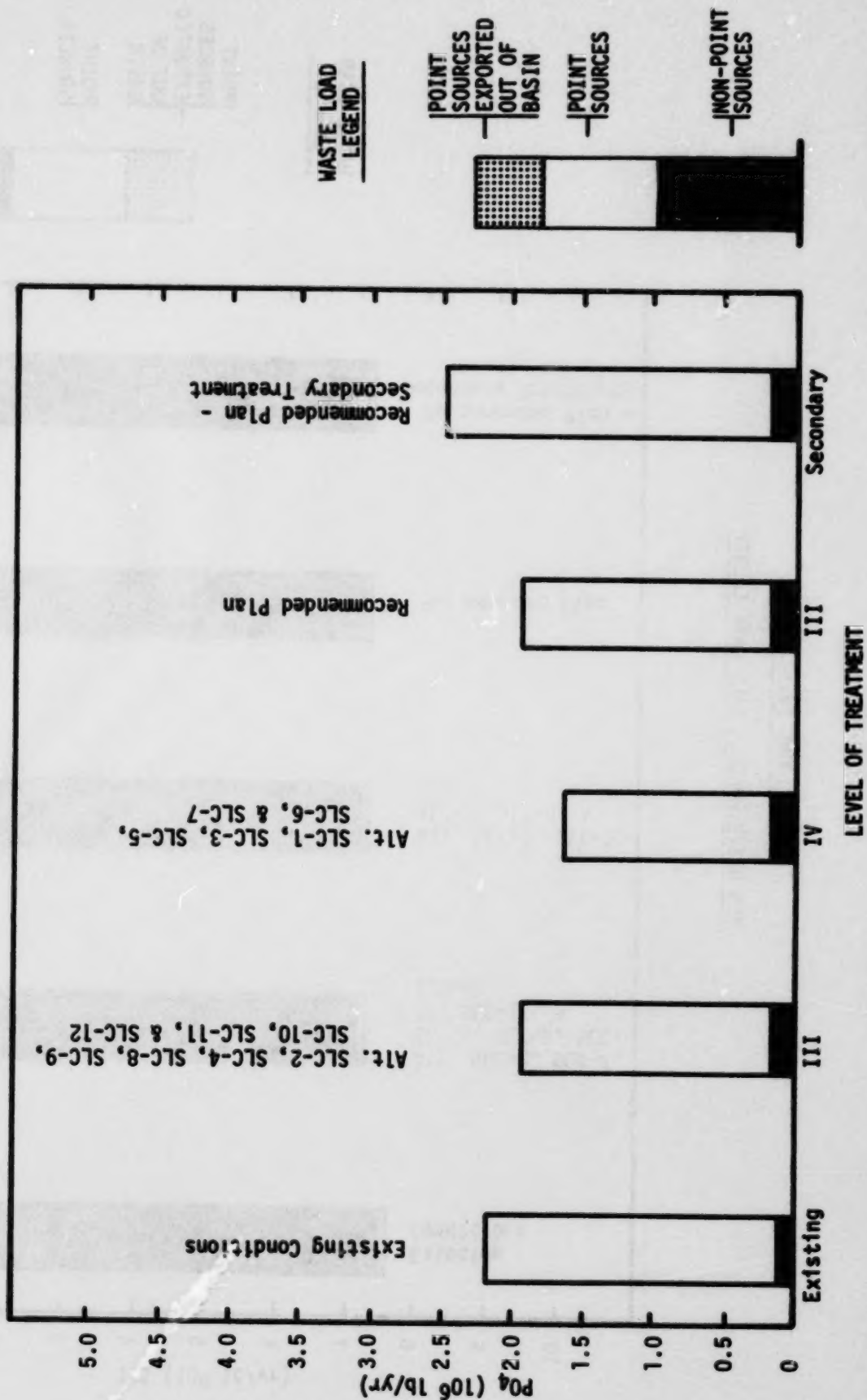
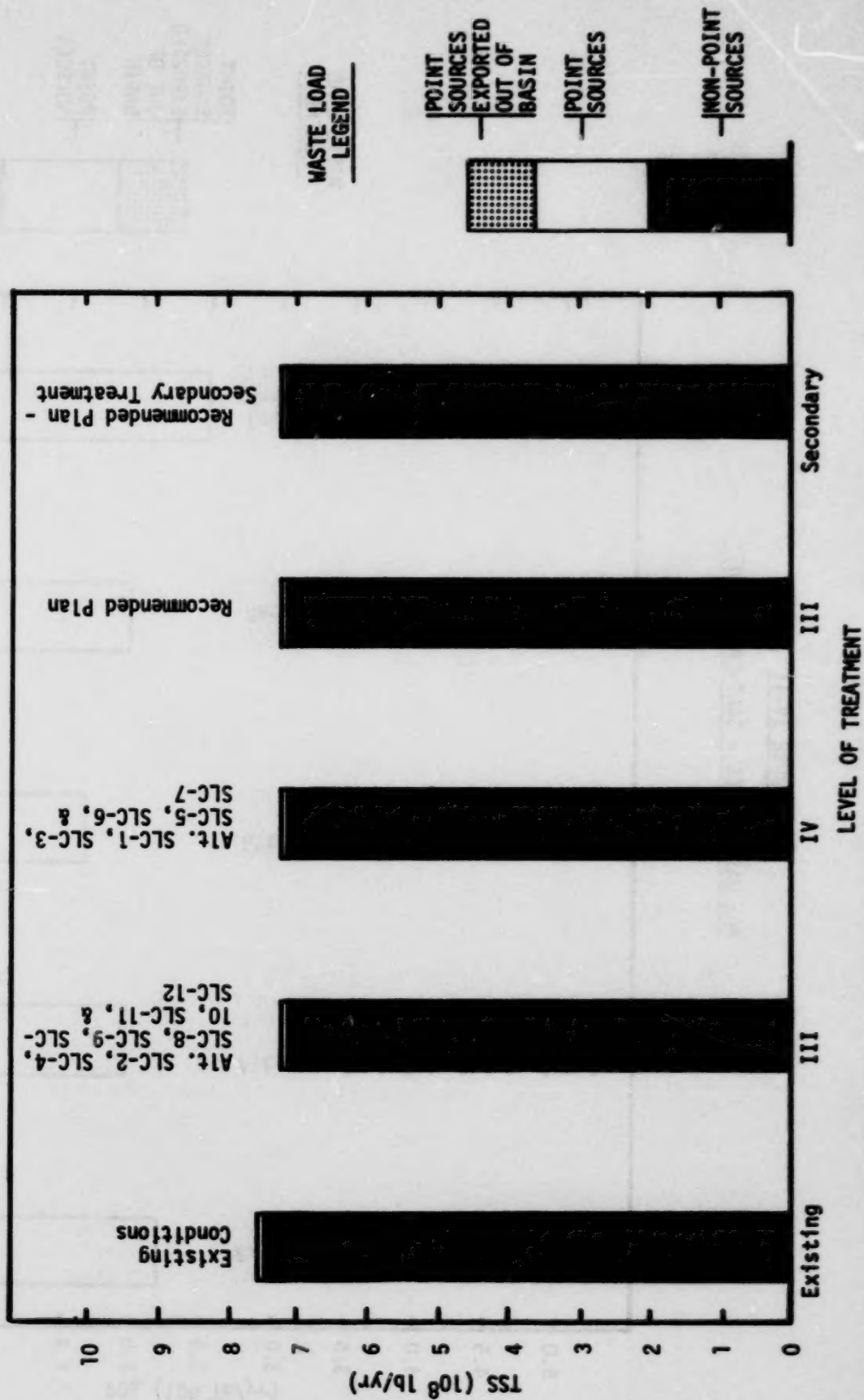


FIGURE IV-12

TSS WASTE LOADS - SALT LAKE COUNTY



Because wastewater treatment plant effluent is the major source of PO_4 in Salt Lake County, the PO_4 total waste load can be reduced by advanced treatment. Level III treatment produces some reduction in the existing waste load, but because wastewater flows are increased (by population increases) in proportion to PO_4 reductions, the net effect is only 13 percent. Level IV treatment results in a somewhat larger reduction, approximately 25 percent. If the recommended plan was implemented at secondary treatment, a 16 percent increase would be realized over existing PO_4 levels.

Total BOD waste loadings resulting from various alternatives manifest reductions similar to PO_4 loads. Level III alternatives reduce existing point source loads and Level IV alternatives account for an even greater reduction. If secondary treatment was considered within the recommended plan, total BOD loadings would increase from 10 million pounds per year to 14 million pounds per year or 40 percent due to population increases.

Coliform bacteria loadings from point sources can be expected to decrease under all future alternatives because of the strict effluent limitations on coliform bacteria for all levels of treatment considered.

An analysis of the Dissolved Oxygen (DO) response in the Jordan River to the various treatment alternatives reveals that the State of Utah's Class "CC" Standard of 6.0 mg/l DO will be violated in the lower Jordan River under all alternatives. In fact, even with no point source BOD discharges to the Jordan River (SLC-7, SLC-8, and SLC-11), the State standard of 6.0 mg/l will still be violated because of non-point sources. Additionally, water quality, as measured by DO, in the Jordan River downstream of the Suburban Sanitation District No. 1 facility (north of 21st Street South) is independent of the alternatives at any single level of treatment, and only a 0.2-0.4 mg/l increase in DO can be expected in the Jordan River if Level IV treatment is implemented rather than Level III.

Aquatic Impact

Potential aquatic ecosystem impacts as a result of the implementation of wastewater treatment alternatives in Salt Lake County can be assessed in light of existing conditions in the Jordan River. Existing mean DO concentration in the River is below the Utah State Standard for Class "CC" waters (6.0 mg/l) and a minimum DO of 2.8 mg/l has been recorded. The phosphate criteria of 0.05 mg/l is exceeded throughout the Jordan River with a maximum observation of 9.0 mg/l. Additionally, bottom substrate conditions are poor throughout the river except for a few miles downstream of the Jordan Narrows and fish population from 7800 Street South to the Great Salt Lake consists almost entirely of rough fish, although some game fish are caught as far north as Second South. Fish population from the Jordan Narrows to 7800 Street South consists of predominantly warm water game fish.

It should be noted that BOD waste loads to an aquatic ecosystem can produce both detrimental impacts (DO reduction) or beneficial impacts (required nutrient for a productive system). Depressed concentrations of DO can be tolerated by various organisms for different lengths of time. This is dependent on other water quality conditions, time of day, and season of year. However, DO levels in the aquatic ecosystem must meet critical life process requirements of the organisms if those

organisms are to sustain themselves. It is likely that decreasing DO concentrations below existing conditions in the Jordan River will begin to stress the ecosystem components and eliminate some less tolerant organisms. For example, under extreme conditions, warm water fish can be maintained at DO levels between 4 and 5 mg/l provided other water quality conditions are favorable. If a diversified warm water biota, including game fish, are desired, DO concentrations should be above 5 mg/l. This also assumes other parameters are within species tolerance levels, not only for fish but for fish food organisms.

BOD is characteristically viewed as an oxygen demand on the aquatic system. However, minimum concentrations of BOD are necessary to provide a "nutrient" loading for utilization in the aquatic ecosystem. No minimum BOD requirements have been established in terms of survival needs of the ecosystem, but apparently in the Jordan River a lack of BOD is not a problem.

These waste load/ecosystem interrelationships and the modelling efforts and projected waste loadings illustrated in Figures IV-8 to IV-12 lead to the following conclusions:

1. Alternatives utilizing Level III treatment are not likely to significantly change the aquatic habitat of the Jordan River.
2. Level IV treatment may show some aquatic habitat improvement but even this is questionable.
3. Alternatives which consolidate treatment of all wastewater at the Salt Lake City Plant with eventual discharge to Great Salt Lake produce the highest DO concentrations in the Jordan River, but still under 6.0 mg/l.
4. Increases in nitrogen as a nutrient load to the Jordan River for alternatives with River discharges will increase the density of vegetation, other factors being favorable. This increase, which may in itself be a nuisance, can cause an additional BOD loading after death of the aquatic plants, may inhibit recreational use of the River, clog irrigation gates and equipment, cause overpopulation and stunting of fish species, and reduce desirable species of benthic organisms by producing anaerobic bottom conditions.
5. Discharges to Great Salt Lake of secondary, Level III or Level IV treated wastewater have an unknown impact on the Lake because of the diking of Farmington Bay. For the Salt Lake County Area, this would apply to discharges from the Salt Lake City facility to the Great Salt Lake via the sewage canal.
6. Decreases in PO_4 due to advanced treatment Level III or Level IV may have no significant impact on the aquatic ecosystem because nitrogen has been defined as the limiting nutrient.

Summary

Based on the previous discussion regarding costs, waste loads, and aquatic impacts of alternative wastewater treatment schemes in Salt Lake County, the following observations can be made:

- . At Level III treatment, Alternatives SLC-9 and SLC-10 are the most economical.
- . At Level IV treatment, SLC-6 is the cheapest.
- . The recommended plan with secondary treatment has a cost of only 54 percent of the recommended plan at Level III.
- . Non-point sources are significant sources of BOD, TDS, TN, and TSS waste loads.
- . The results of modelling efforts indicate that DO concentrations in the Jordan River will drop below the Utah State Standard of 6.0 mg/l for all levels of treatment because of BOD loadings by non-point sources.
- . No significant DO increase in the Jordan River will be observed if Level IV treatment is implemented rather than Level III.
- . DO concentrations downstream of SLC - SSD #1 (north of 21st Street South) are independent of the degree of regionalization, assuming the same level of treatment at all plants.
- . The existing water quality and bottom substrate conditions are poor for a viable aquatic habitat in the Jordan River. Implementation of Level III or Level IV alternatives is not likely to improve these conditions. Conveying all wastewater to the Salt Lake City facility with discharge to Great Salt Lake via the Sewage Canal improves the water quality to some degree, but still not enough to support a cold water fishery.
- . Reducing PO₄ waste loads will likely have no aquatic impact because the Jordan River is nitrogen deficient. Because of the situation, however, future increases in TN waste loads may cause nuisance aquatic growth and secondary impacts.

MAGNA AREA

The Magna Area comprises that portion of Salt Lake County which drains directly into Great Salt Lake. One community, Magna, the single largest industrial complex in the Study Area, Kennecott Copper, a chemical plant, and several salt and mineral recovery operations are essentially the totality of man's development in the Magna Area. Because of this limited urban development, no detailed discussion is presented in the Plan on alternative wastewater treatment schemes for the area. A recommendation is made that Magna implement Level III treatment. An attempt was made to broaden the analysis by comparing the benefits of the recommended plan (Level III treatment) to Level IV and to secondary treatment. These alternatives are shown in Figure IV-13.

Cost Analysis

The treatment costs associated with each of the Magna Area alternatives are presented in Table IV-4. The recommended plan with Magna at Level III is obviously more economical than the Level IV treatment alternative. However, the cost of the recommended plan with secondary treatment has an associated cost of only 55 percent of the recommended plan at Level III.

FIGURE IV-13

WASTEWATER TREATMENT ALTERNATIVES
MAGNA AREA

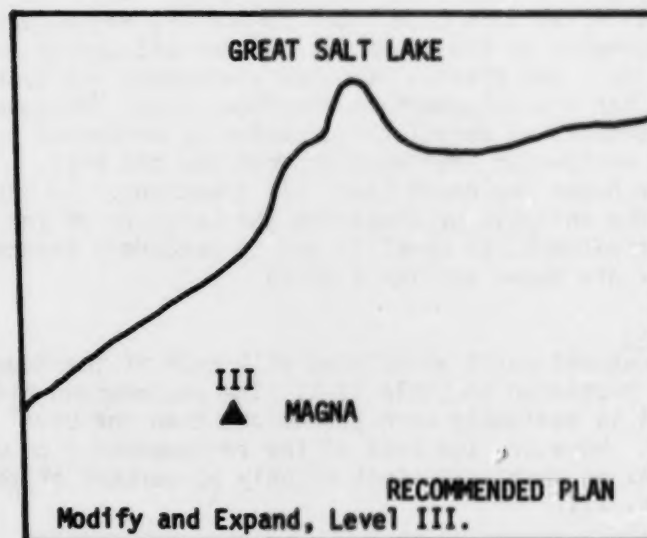
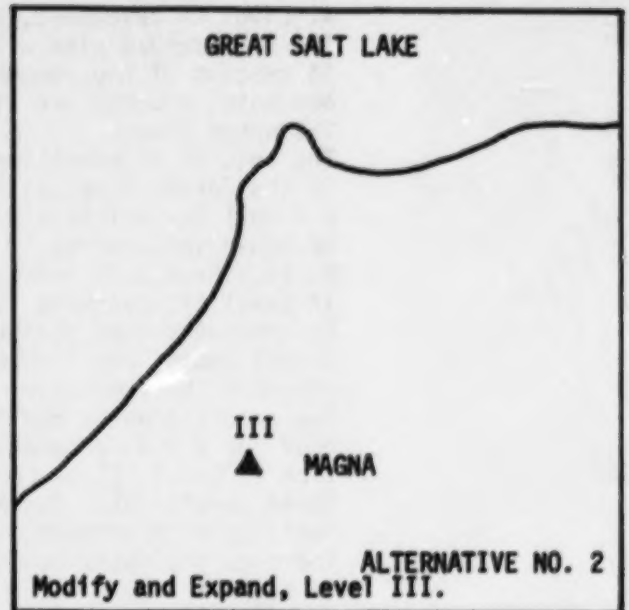
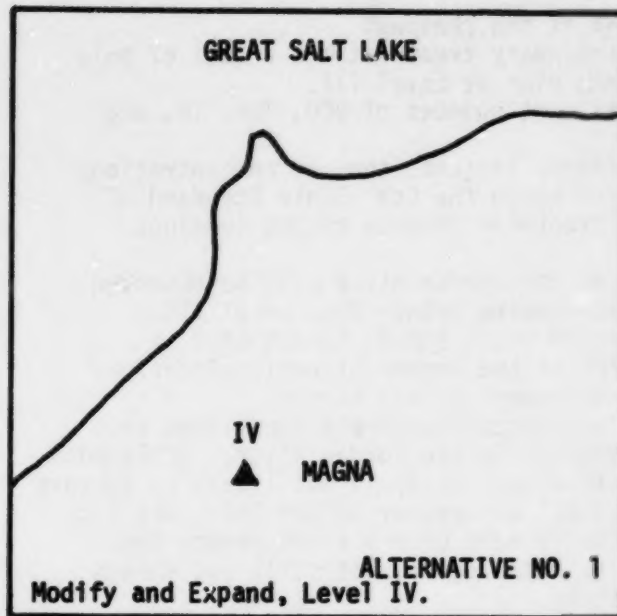


TABLE IV-4
COST ANALYSIS FOR MAGNA AREA

<u>Categories of Alternatives</u>	<u>Capital Cost (\$10⁶)</u>	<u>Annual Operation & Maintenance Cost (\$10⁶/Yr)</u>	<u>Annual Cost¹ Per Capita (\$/Cap/Yr)</u>
<u>Level III Alternative</u>			
MA-2	1.73	0.15	24.22
<u>Level IV Alternative</u>			
MA-1	3.13	0.19	38.28
<u>Recommended Plan</u>			
Level III	1.73	0.15	24.22
Secondary	0.93	0.08	13.28

¹Annual Cost per Capita is for comparison among alternatives only. They were derived by dividing the total annual cost by the median population between existing conditions and 1995 (Table IV-1). These data are intended to reflect an average cost over the life of the facility and do not represent actual cost per capita nor is the potential for 75 percent Federal funding reflected.

Waste Load Analysis

Point and non-point waste loads for the Magna Area are illustrated in Figures IV-14 through IV-18. Because of the minimal development anticipated for the area, future non-point loads are not expected to change significantly from existing conditions. Future point source pollutant loads for all parameters considered except Total Suspended Solids are expected to decrease markedly under any alternative treatment scheme. This would include coliform bacteria. The fact that any alternative manifests almost the identical reduction reflects the significant contribution from industry to the area's point source loading. Future industrial wastewater effluents were assumed to meet EPA effluent requirements and because these sources comprise such a large part of total point source loadings to the area, the various levels of proposed treatment at Magna have little effect on the total point source waste load.

Aquatic Impact

It is difficult to derive any quantitative aquatic impacts associated with the alternative wastewater treatment schemes for the Magna area because of the heavy industrial contribution and the lack of existing water quality data. Notwithstanding this situation, it seems reasonable to conclude that advanced wastewater treatment alternatives are not likely to alter future aquatic impacts because of the extremely large contributions of industrial waste loads. Localized aquatic impacts to Kersey Creek may be improved with advanced treatment, but because this Creek is more of a drainage canal for surrounding tailing ponds than a viable stream, it is questionable if advanced treatment would significantly improve the aquatic ecosystem. If the predicted reductions in industrial waste loads are realized, some aquatic habitat improvement may result in the drains and canals serving the Magna Area. However, because of the natural character of these waters, such improvement is questionable.

Summary

The following observations are made regarding the costs, waste loads, and aquatic impacts associated with the Magna Area wastewater treatment alternatives:

- . The recommended plan with Level III treatment for Magna is nearly twice as expensive as secondary treatment and two-thirds the cost of Level IV treatment.
- . Industrial sources contribute 90-95 percent of the total point source waste loads of BOD, TDS, PO₄, and TSS, and 35 percent of the TN waste load. Future reductions in future waste loads are primarily attributable to industrial waste load reductions not advanced wastewater treatment.
- . Advanced wastewater treatment processes are not likely to alter any future water quality impacts even at the localized level.

NORTHERN UTAH COUNTY

Northern Utah County comprises the area drained by the American Fork River. The major communities in the area are Lehi, American Fork,

FIGURE IV-14
BOD WASTE LOADS - MAGNA AREA

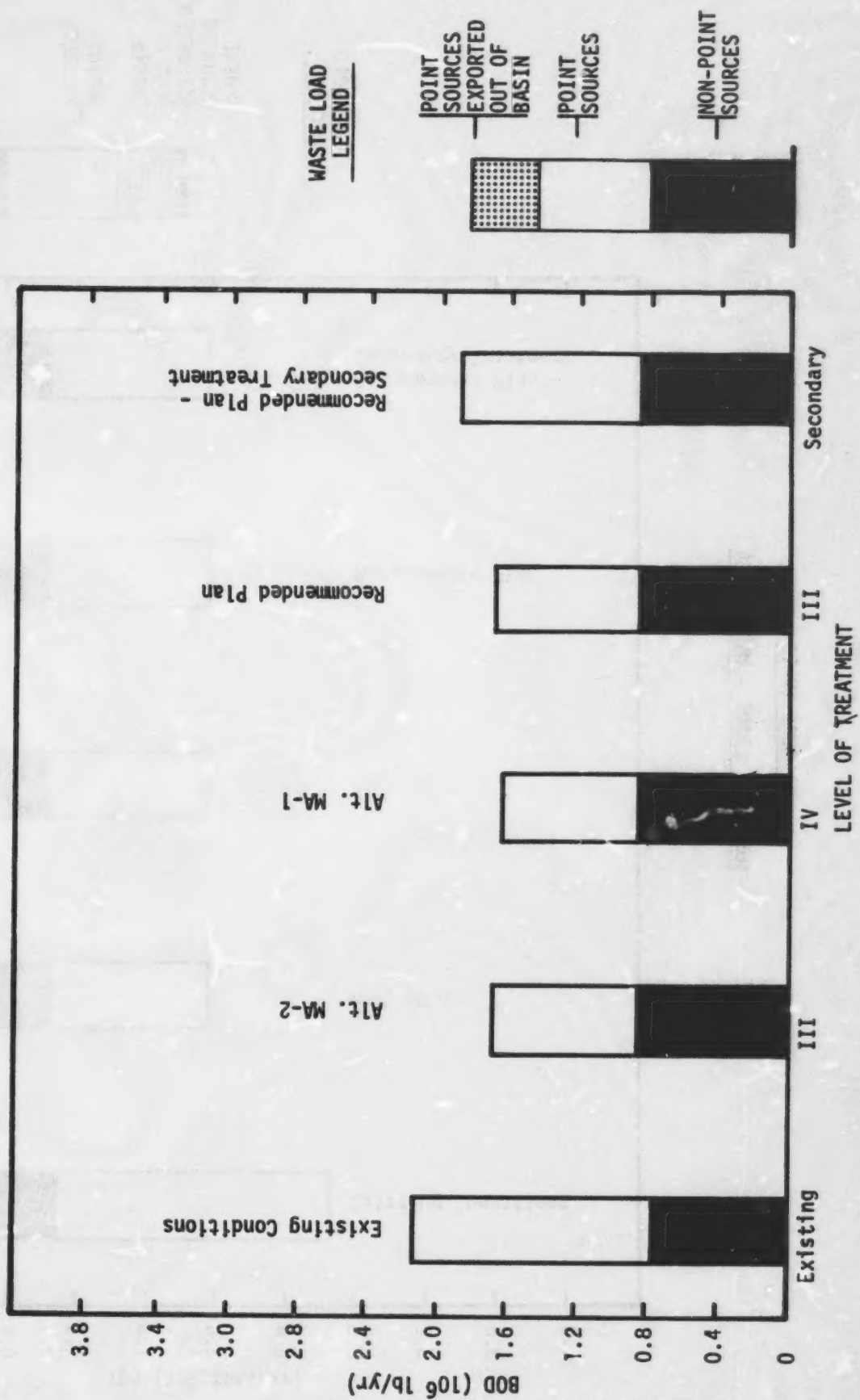


FIGURE IV-15
TDS WASTE LOADS - MAGNA AREA

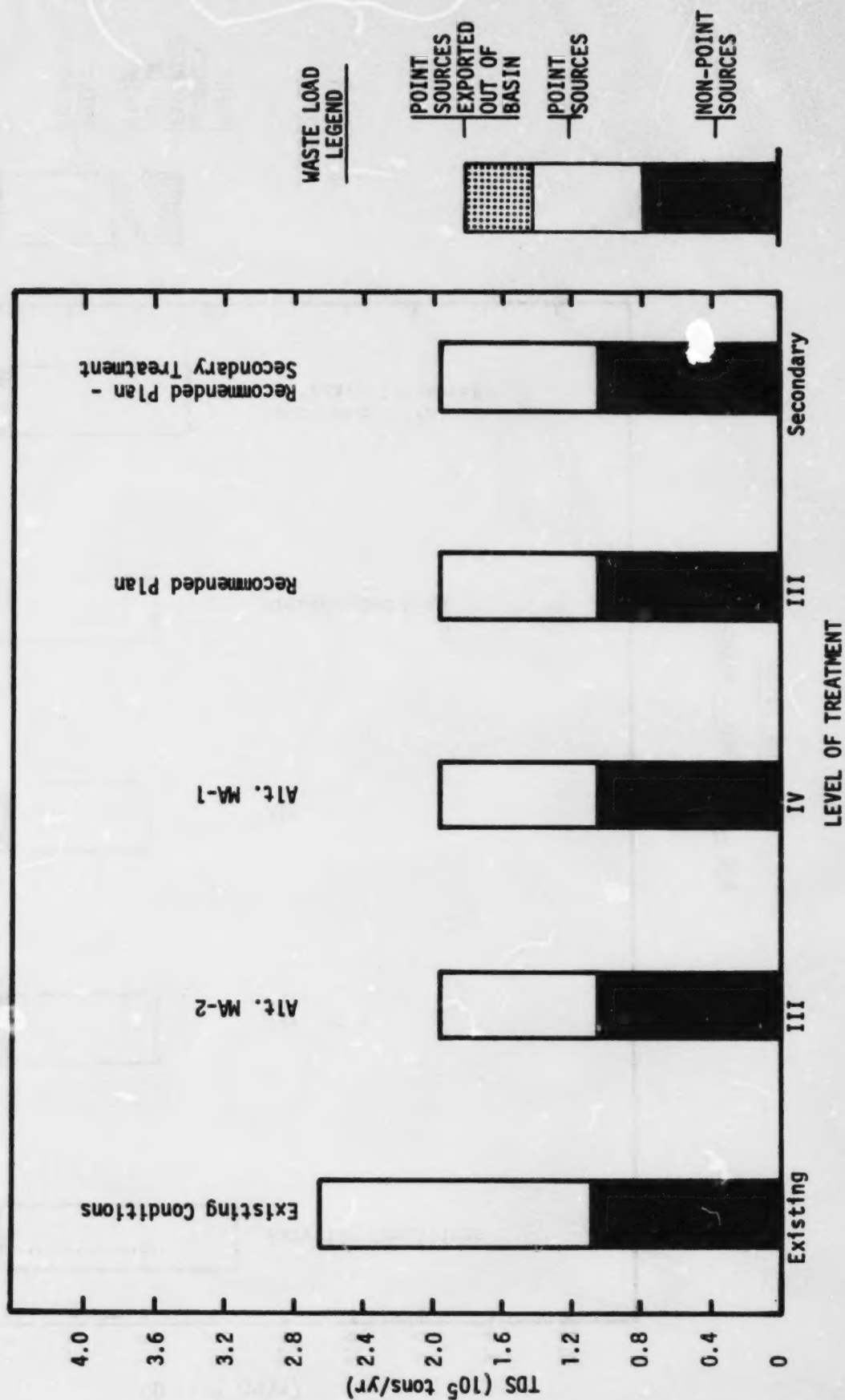


FIGURE IV-16
TN WASTE LOADS - MAGNA AREA

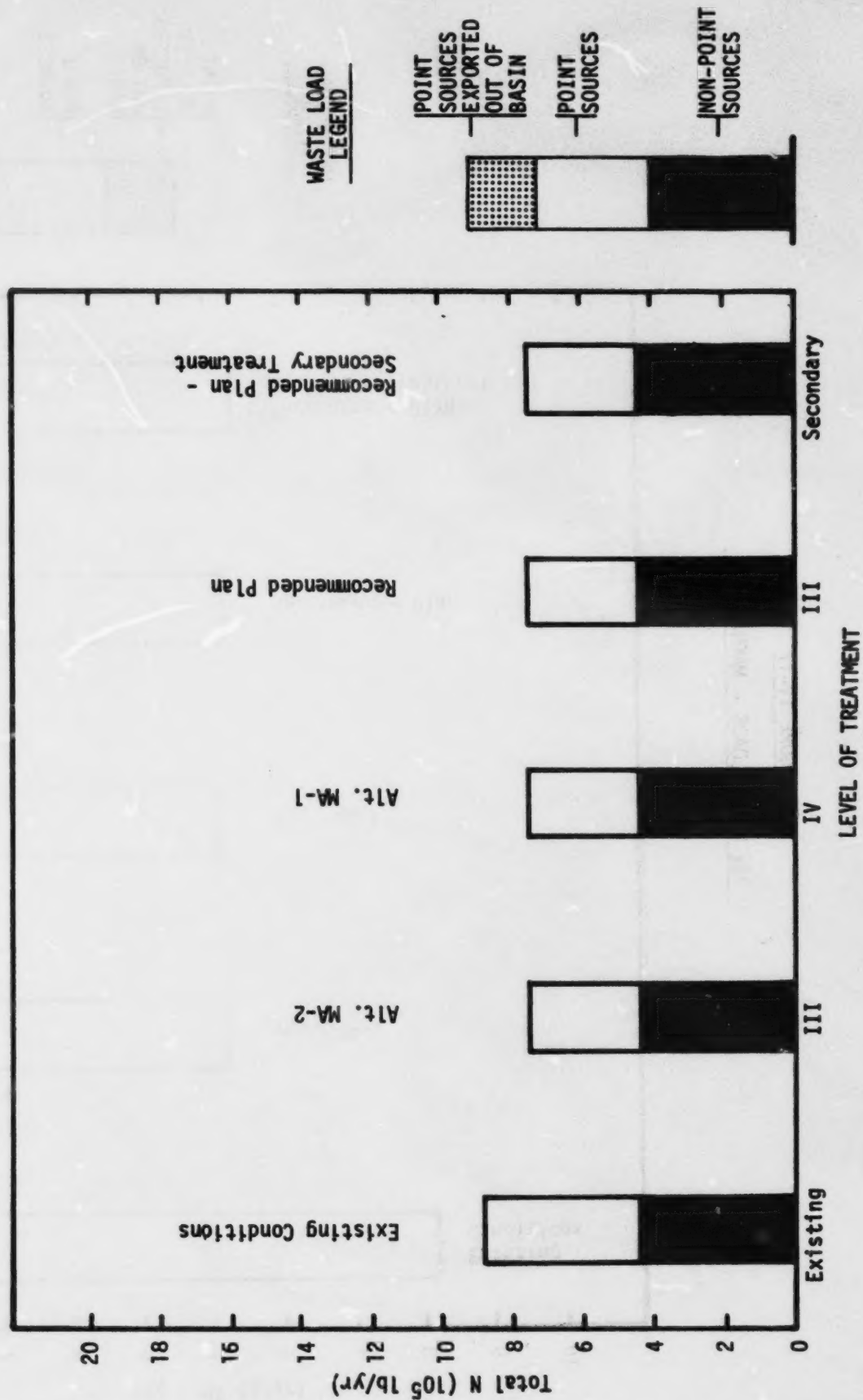


FIGURE IV-17

PO₄ WASTE LOADS - MAGNA AREA

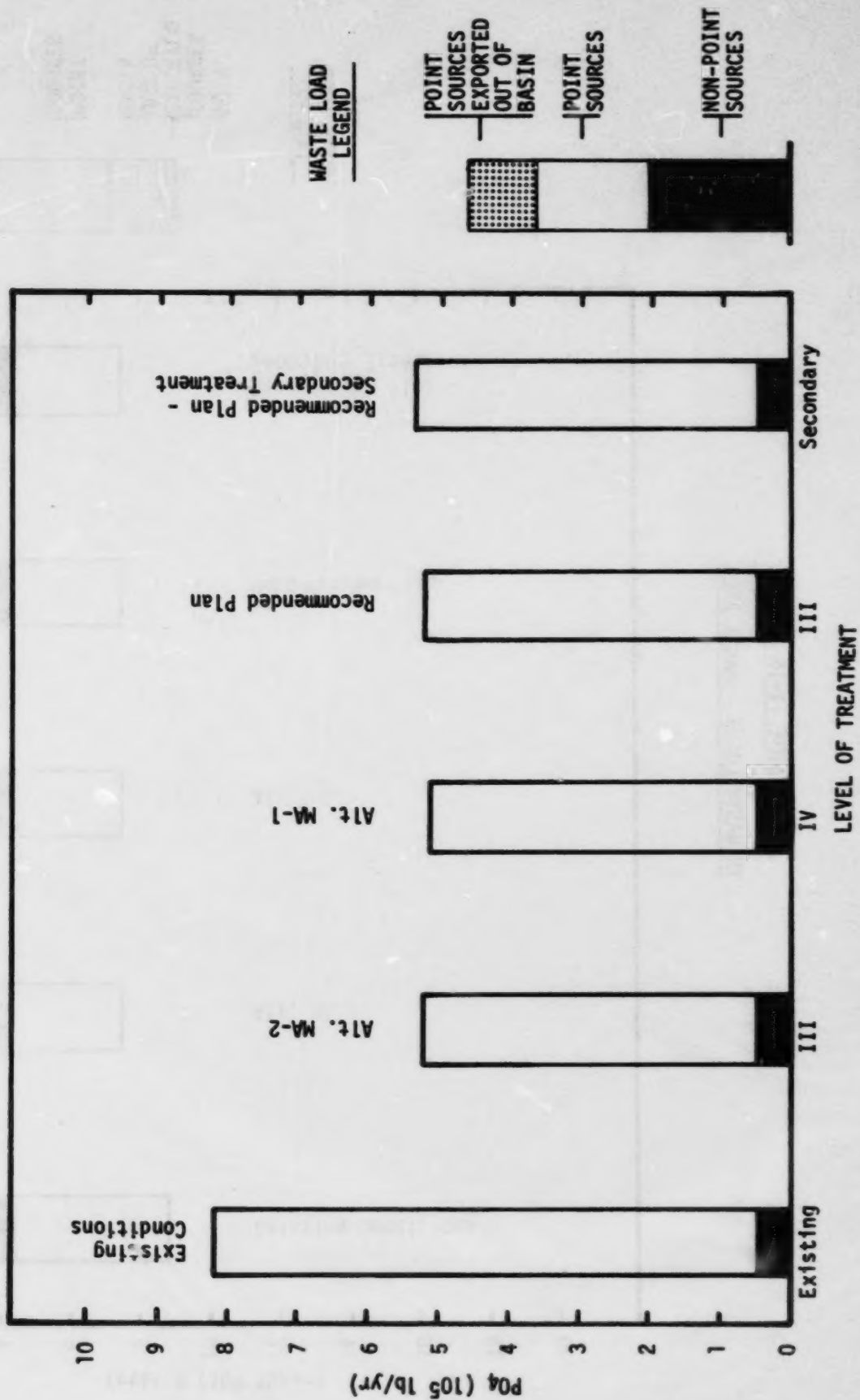
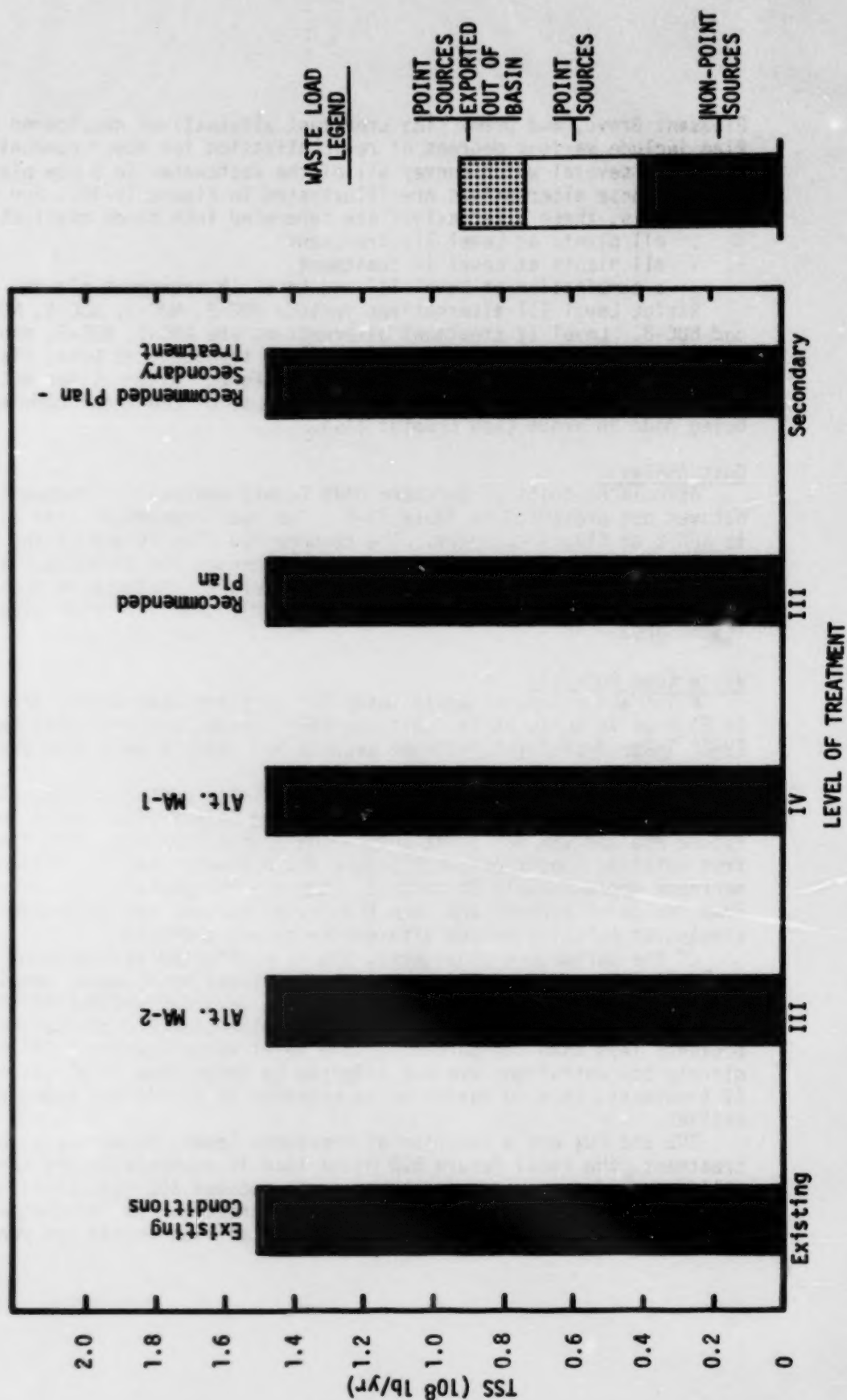


FIGURE IV-18

TSS WASTE LOADS - MAGNA AREA



Pleasant Grove, and Orem. The treatment alternatives considered in the Plan include various degrees of regionalization for these communities including several which convey all of the wastewater to a new plant near Provo. These alternatives are illustrated in Figure IV-19. For purposes of analysis, these alternatives are separated into three distinct groups:

- . all plants at Level III treatment
- . all plants at Level IV treatment
- . a combination of Level III and Level IV treatment plants.

Strict Level III alternatives include NUC-2, NUC-3, NUC-6, NUC-7, and NUC-8. Level IV treatment alternatives are NUC-1, NUC-5, and NUC-9. Alternative NUC-4 is comprised of Level IV treatment at Lehi, Pleasant Grove, and Orem and Level III at American Fork. Alternatives NUC-10, NUC-11, and NUC-12 were not evaluated because of the local commitments being made in Provo (see Chapter III).

Cost Analysis

Associated costs of Northern Utah County wastewater treatment alternatives are presented in Table IV-5. The most economical plan alternative is NUC-2 at \$17.04/cap/year. The recommended plan is one of the least costly, \$18.02/cap/year and could be implemented for \$9.92/cap/year if secondary treatment was permitted. If Level IV treatment is desired, NUC-9 at \$26.92/cap/year would be less costly than any other alternative in the group.

Waste Load Analysis

Point and non-point waste loads for Northern Utah County are illustrated in Figures IV-20 to IV-24. Nitrate (NO_3) values are presented in Figure IV-22 instead of Total Nitrogen because NO_3 data is much more prevalent for the area.

Non-point sources account for a significant portion of BOD, Total Suspended Solids (TSS), and Total Dissolved Solids (TDS) waste loads. Future BOD and TSS non-point source loadings do not vary significantly from existing conditions, but future TDS non-point source loadings do decrease approximately 25 percent. NO_3 and Phosphates (PO_4) contributions from non-point sources are less than seven percent and 20 percent, respectively, of existing or any alternative future condition.

Of the parameters considered, TDS is unaffected by treatment levels, thus all future alternatives manifest identical total waste loadings. TSS, although affected by treatment level, does not reflect different loadings among alternatives because the point source contribution represents less than one percent of the total waste loading. Effluent nitrate concentrations are not affected by going from Level III to Level IV treatment, thus no variation in nitrates is manifested among alternatives.

BOD and PO_4 are a function of treatment level, however with Level III treatment, the total future BOD waste load is essentially the same, 1.7 million pounds per year, as the present, because BOD reductions are offset by population growth. If Level IV treatment is implemented, the BOD waste load would decrease to about 1.5 million pounds per year.

FIGURE IV-19

WASTEWATER TREATMENT ALTERNATIVES - NORTHERN UTAH COUNTY

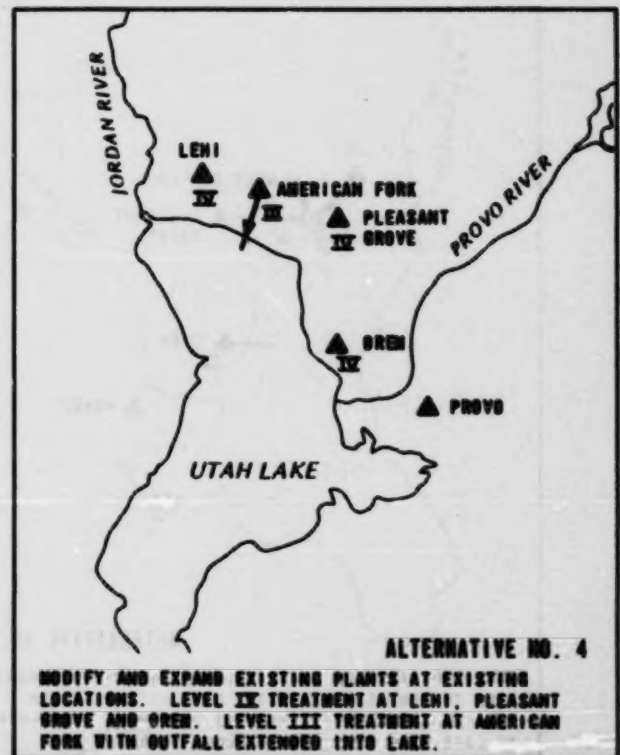
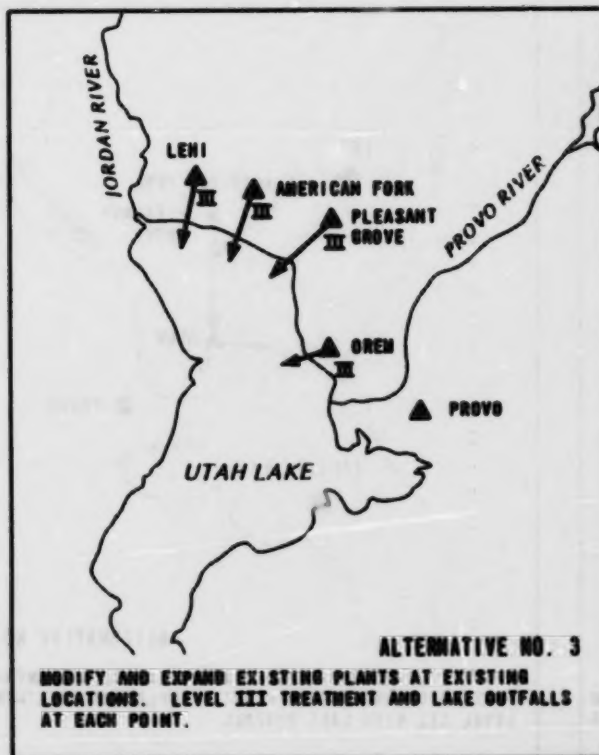
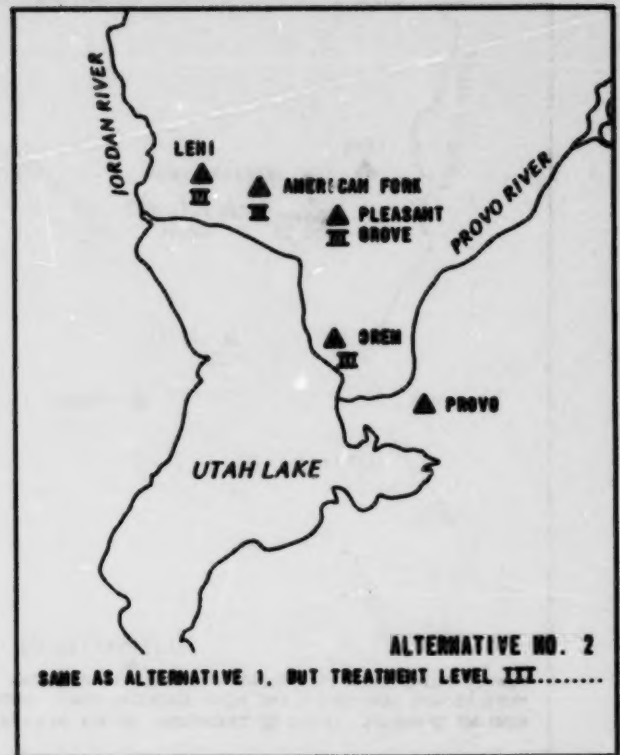
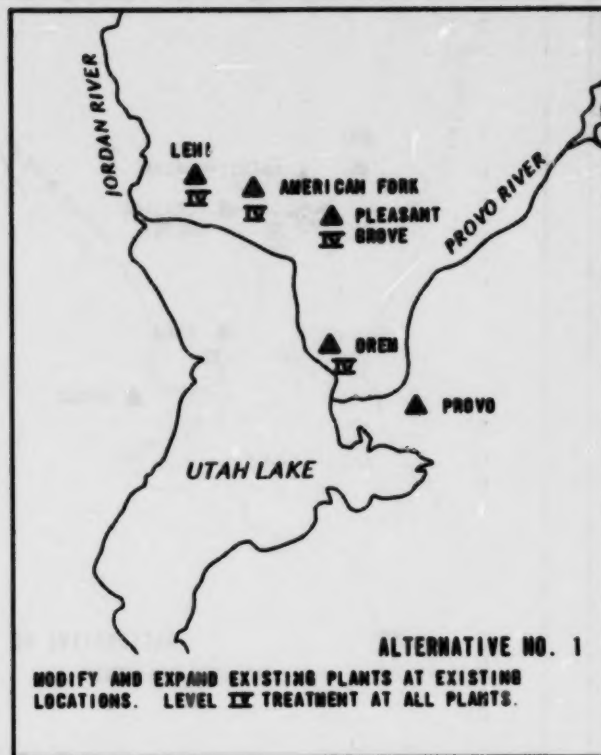


FIGURE IV-19 (Continued)

WASTEWATER TREATMENT ALTERNATIVES - NORTHERN UTAH COUNTY

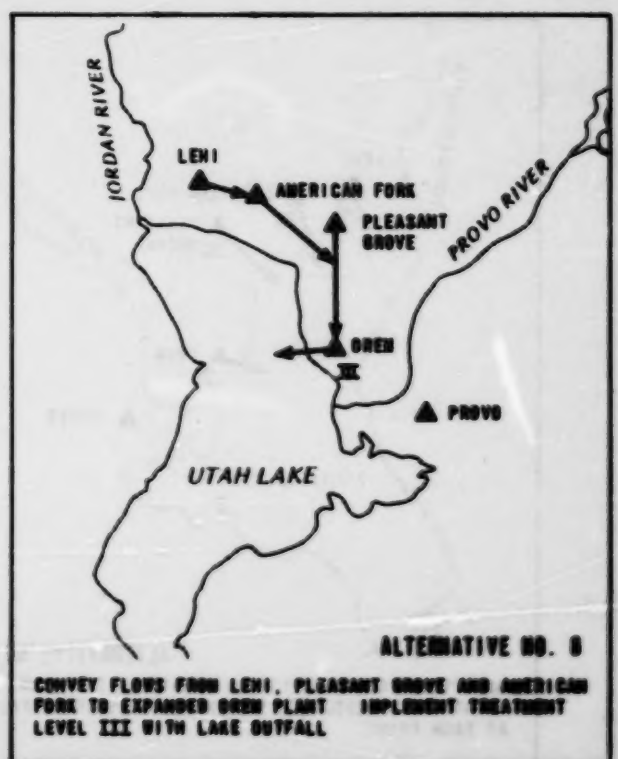
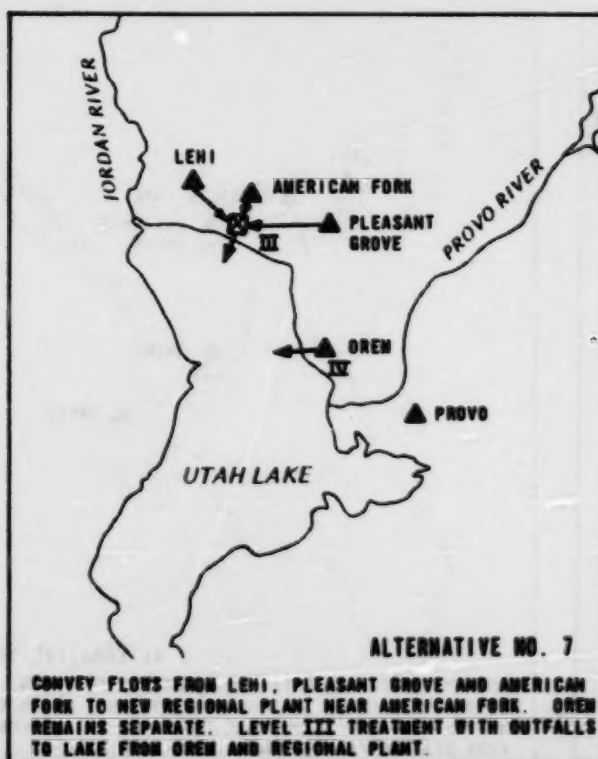
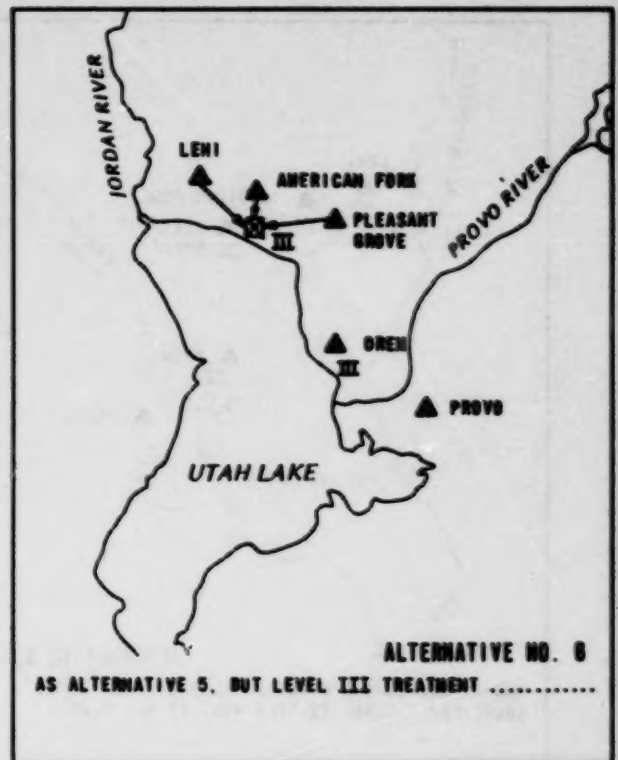
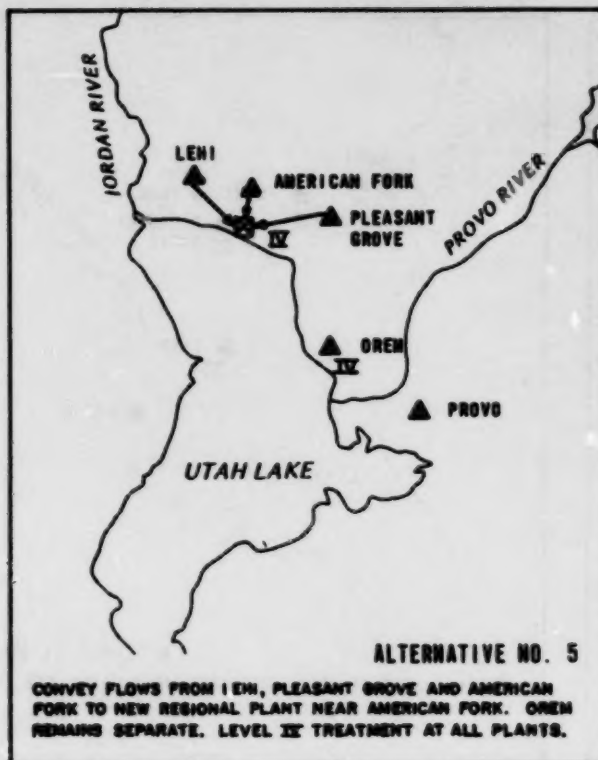


FIGURE IV-19 (Continued)

WASTEWATER TREATMENT ALTERNATIVES - NORTHERN UTAH COUNTY

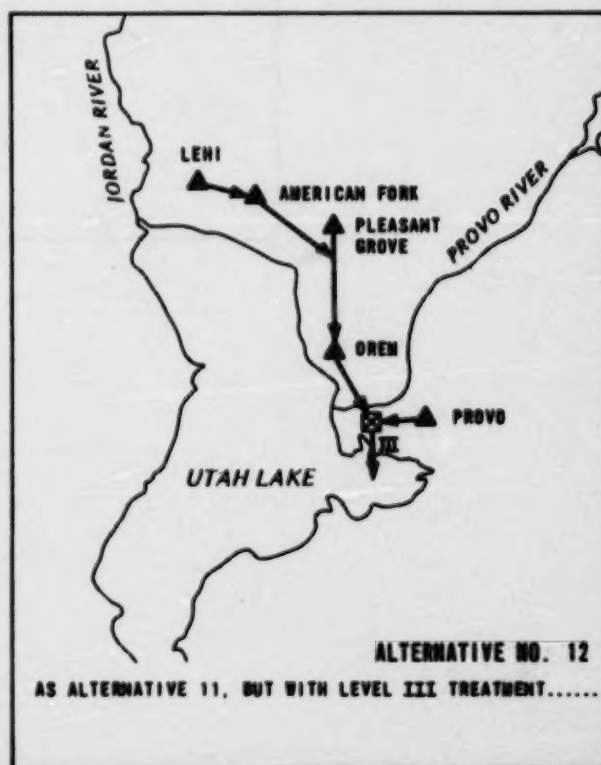
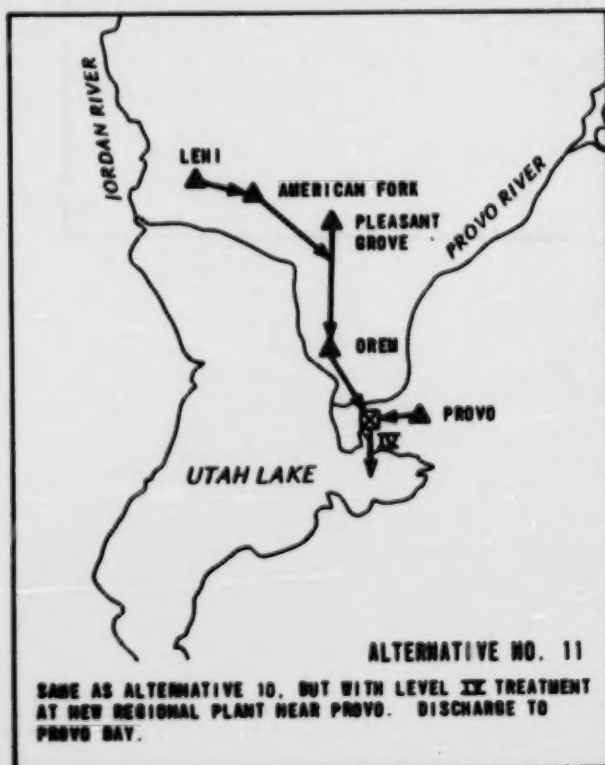
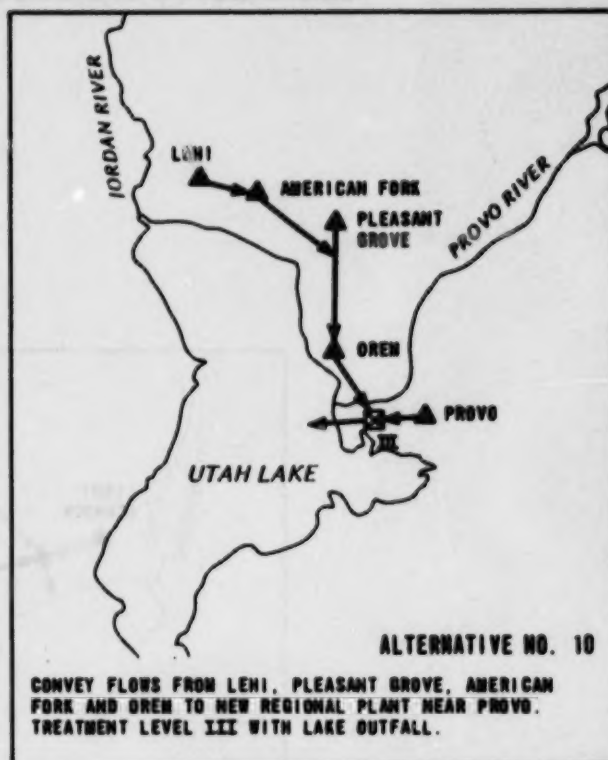
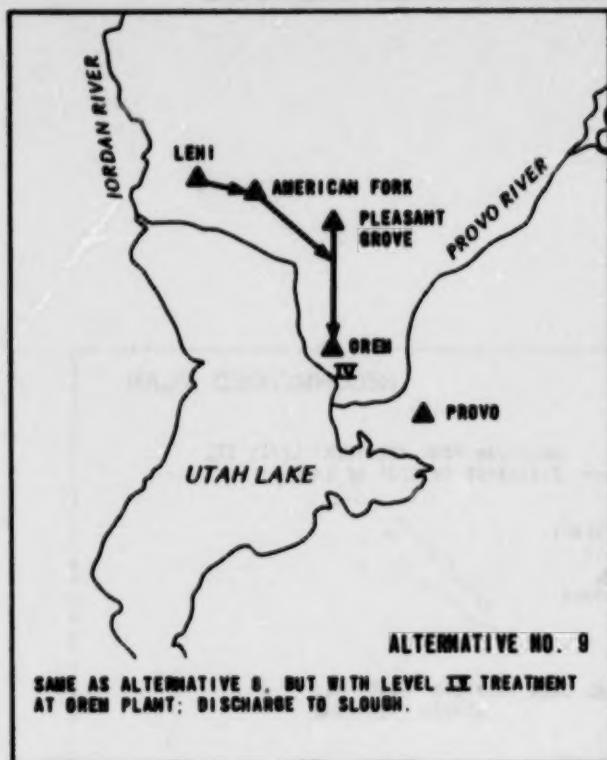


FIGURE IV-19 (Continued)

WASTEWATER TREATMENT ALTERNATIVES - NORTHERN UTAH COUNTY

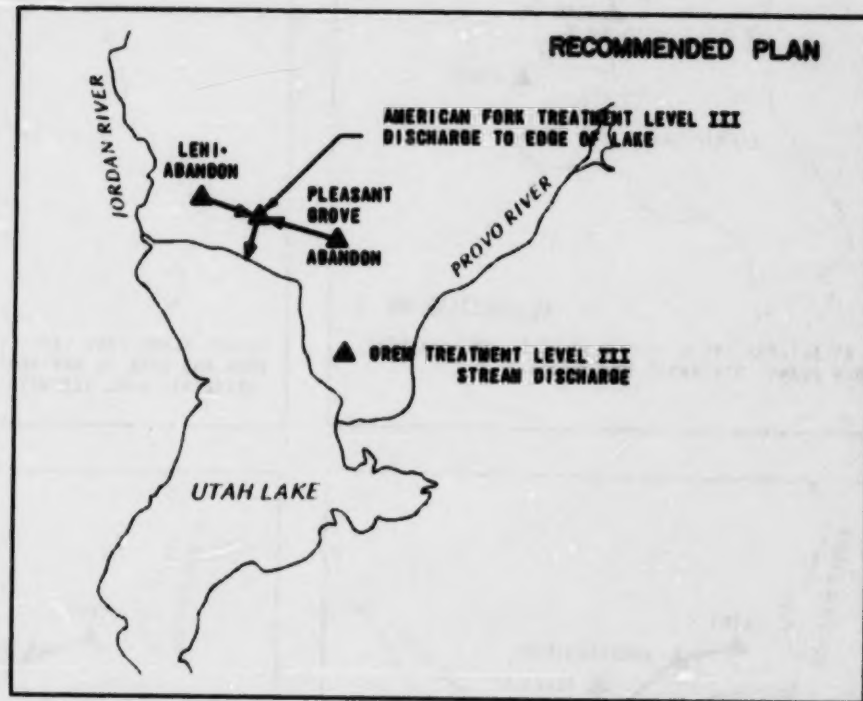


TABLE IV-5
COST ANALYSIS FOR NORTHERN UTAH COUNTY

<u>Categories of Alternatives</u>	<u>Capital Cost (\$10⁶)</u>	<u>Annual Operation & Maintenance Cost (\$10⁶/Yr)</u>	<u>Annual Cost¹ Per Capita (\$/Cap/Yr)</u>
<u>Level III Alternatives</u>			
NUC-2	6.28	0.63	17.04
NUC-3	9.05	0.63	19.83
NUC-6	8.61	0.52	18.02
NUC-7	10.11	0.52	19.55
NUC-8	9.65	0.30	17.46
NUC-10	Alternative not currently valid.		
NUC-12	Alternative not currently valid.		
<u>Level IV Alternatives</u>			
NUC-1	13.01	0.84	29.05
NUC-5	14.91	0.74	29.47
NUC-9	14.18	0.66	26.96
NUC-11	Alternative not currently valid.		
<u>Levels III & IV Alternatives</u>			
NUC-4	12.73	0.82	28.21
<u>Recommended Plan</u>			
Level III	8.61	0.52	18.02
Secondary	5.31	0.26	9.92

¹Annual Cost per Capita is for comparison among alternatives only. They were derived by dividing the total annual cost by the median population between existing conditions and 1995 (Table IV-1). These data are intended to reflect an average cost over the life of the facility and do not represent actual cost per capital nor is the potential for 75 percent Federal funding reflected.

FIGURE IV-20
BOD WASTE LOADS - NORTHERN UTAH COUNTY

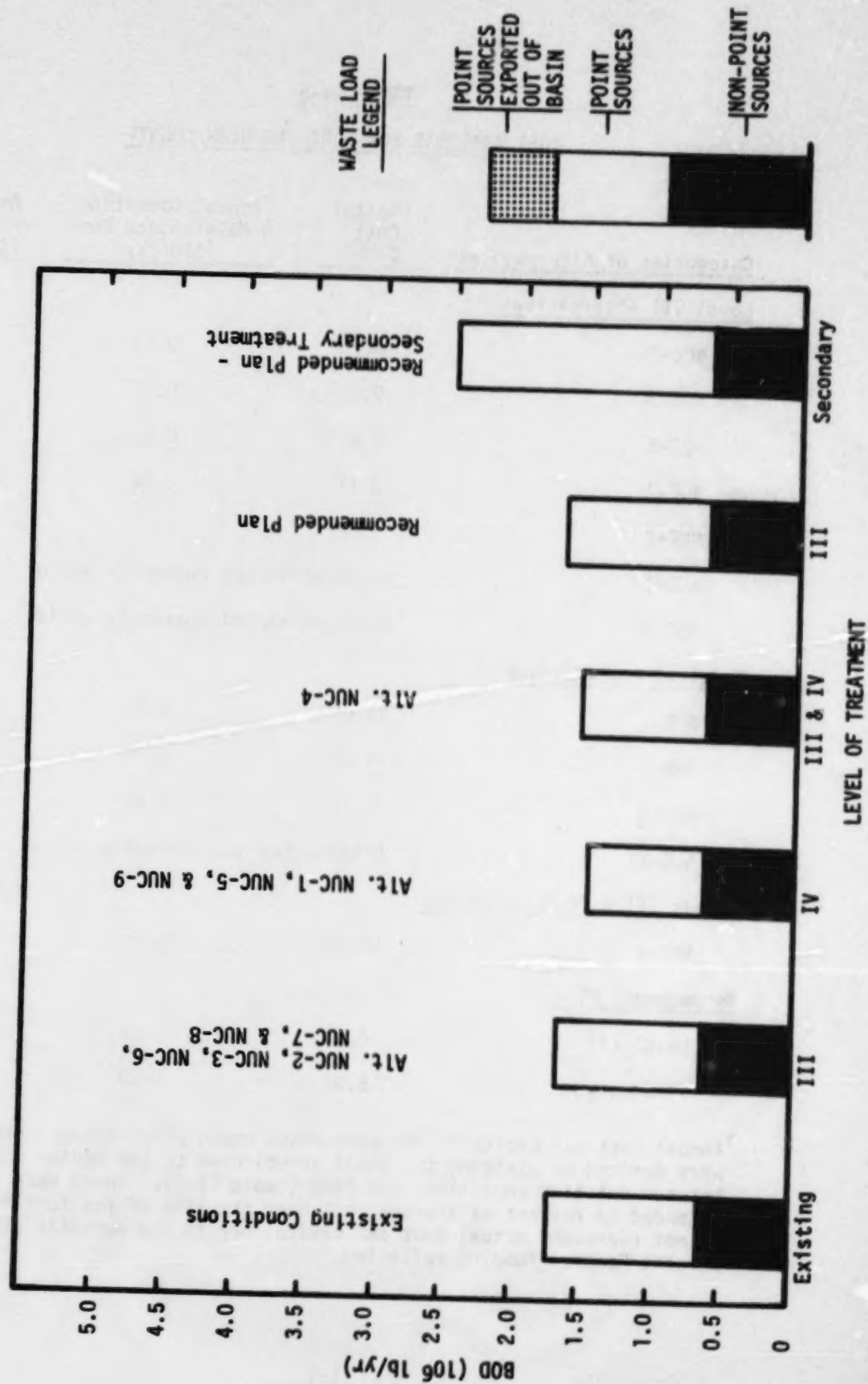


FIGURE IV-21

TDS WASTE LOADS - NORTHERN UTAH COUNTY

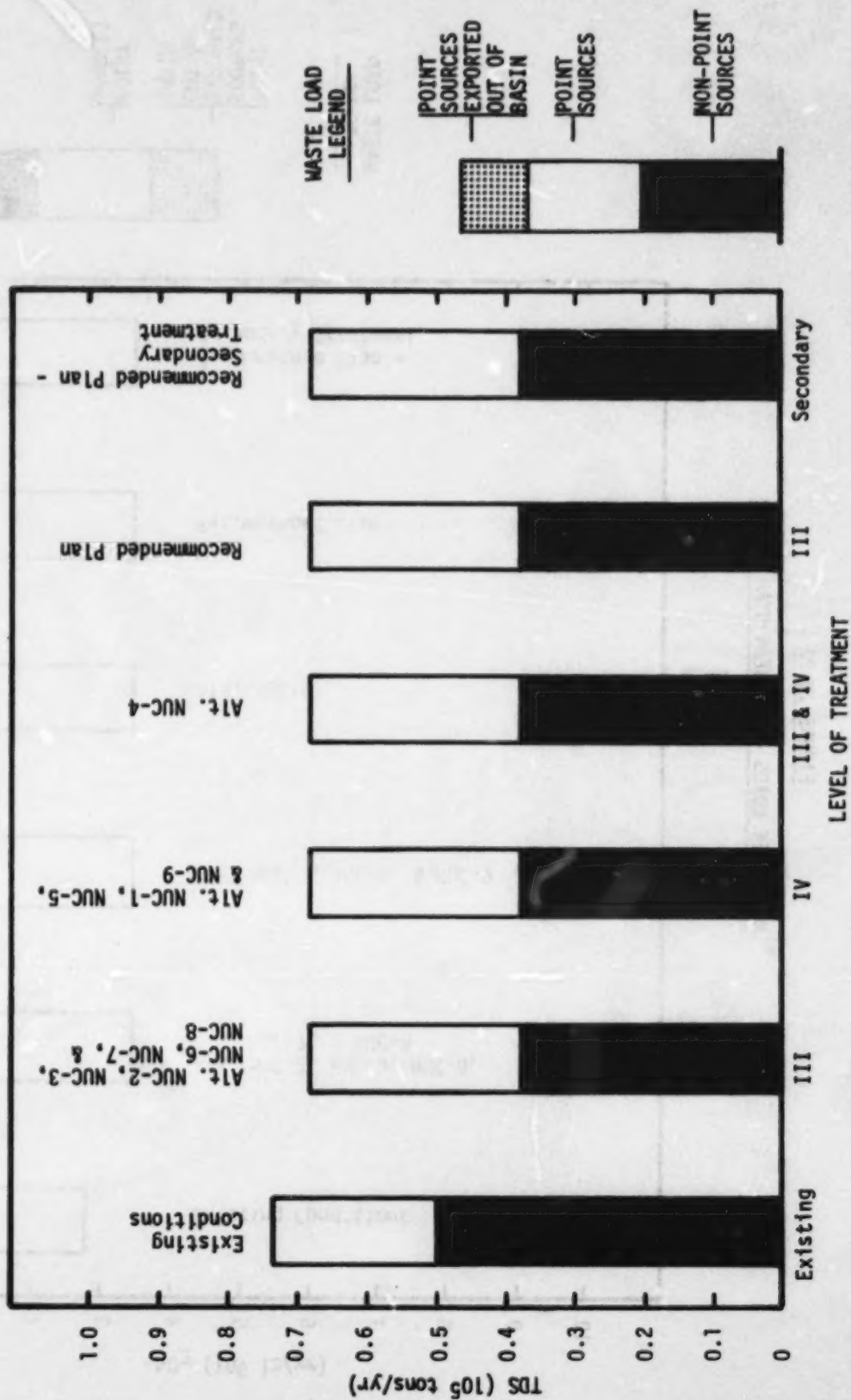


FIGURE IV-22

a) NO₃ WASTE LOADS - NORTHERN UTAH COUNTY

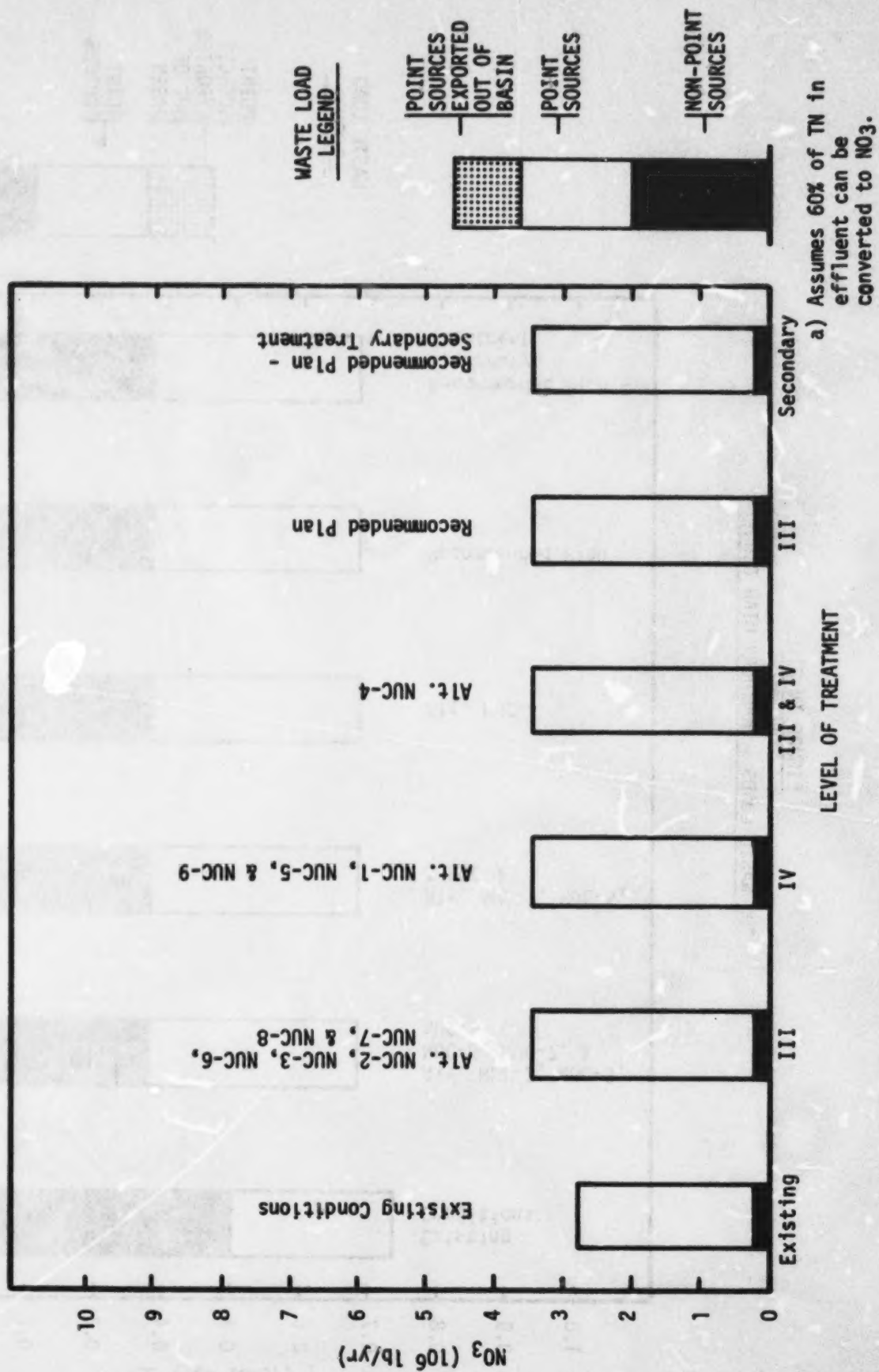


FIGURE IV-23

P04 WASTE LOADS - NORTHERN UTAH COUNTY

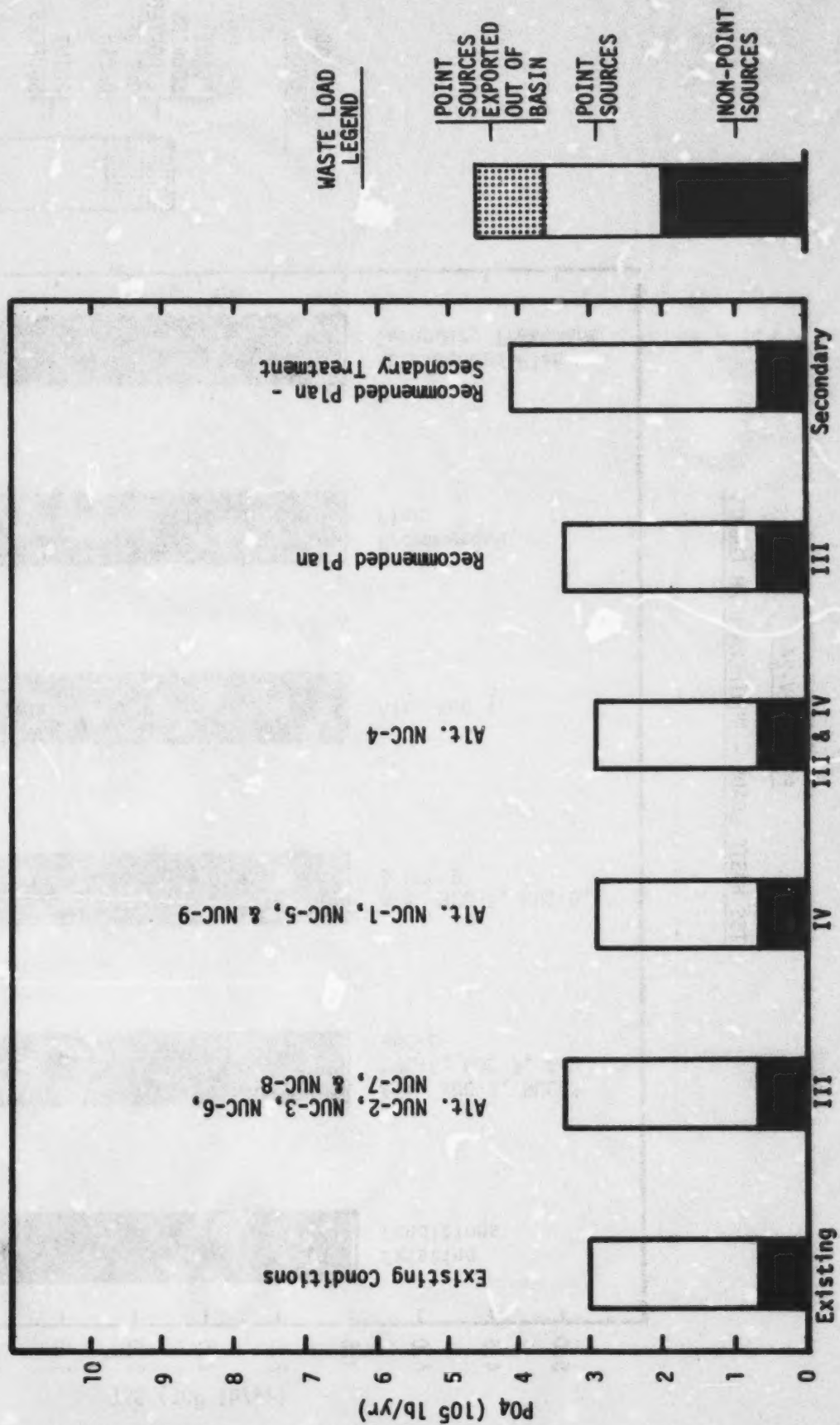
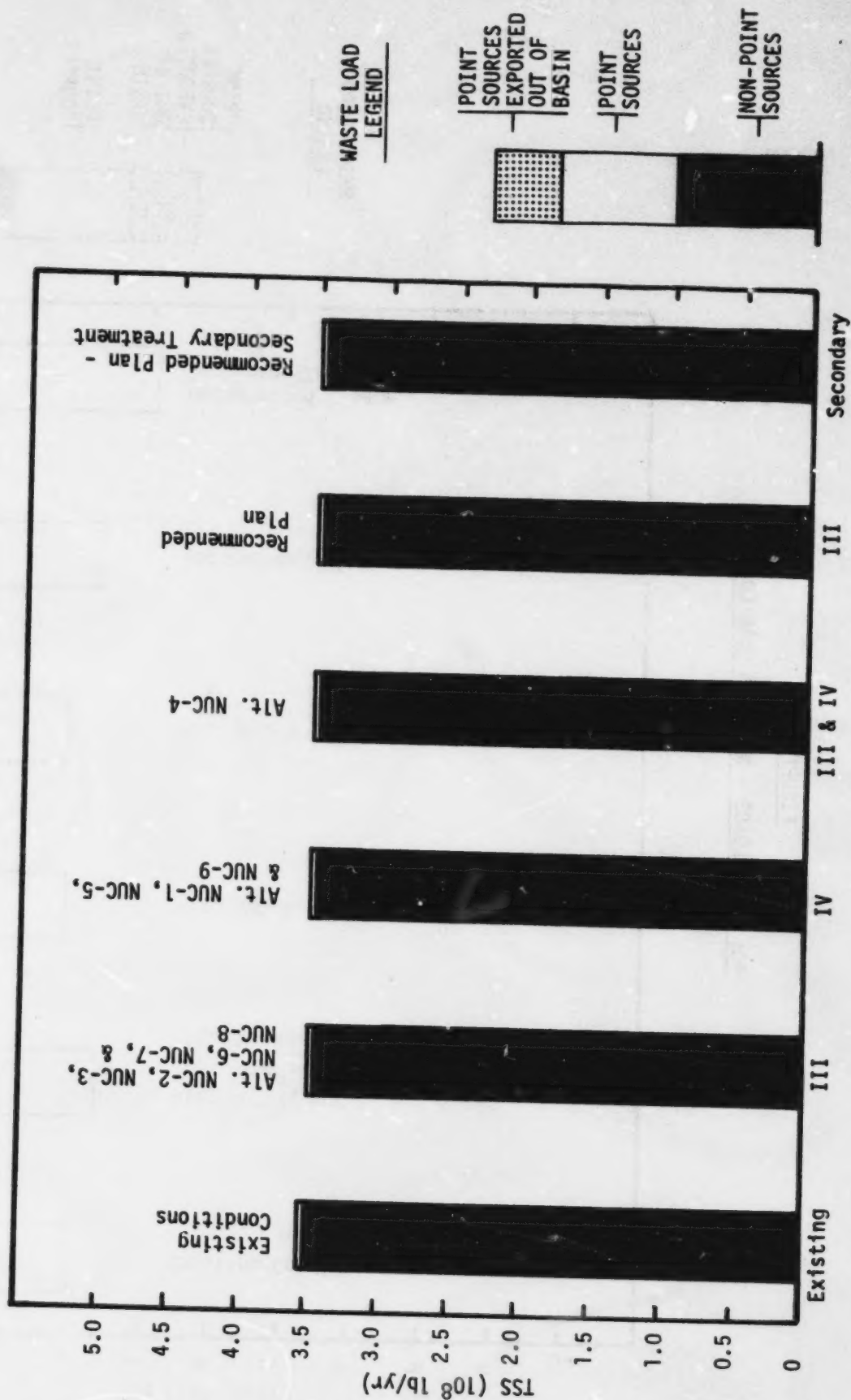


FIGURE IV-24

TSS WASTE LOADS - NORTHERN UTAH COUNTY



Industrial waste loads of BOD amount to nearly 700,000 pounds per year or approximately 40 percent of the total BOD loading. PO₄ waste loads for existing conditions, Level III and Level IV alternatives fluctuate around 300,000 pounds per year. Only a ten percent reduction in the total PO₄ waste load is realized if Level IV treatment is implemented rather than Level III, again because of population increase. Both BOD and PO₄ waste loads would increase significantly over the existing conditions if secondary treatment was utilized.

Coliform bacteria loadings from point sources can be expected to decrease under all future alternatives because of the strict effluent limitations on coliform bacteria for all levels of treatment considered.

Aquatic Impact

The aquatic impacts associated with wastewater treatment alternatives in Northern Utah County are related to Utah Lake because treatment plants and industrial sources discharge close to or directly to the Lake. Based on this and because the total BOD waste loading is only slightly reduced for Level III and Level IV alternatives, no significant increase in the DO of Utah Lake should result. For alternatives containing recommendations for regionalization, increased flows may impose some localized DO reductions; however, the mean DO concentration in Utah Lake in the Northern Utah County area ranges from 6.0 to 8.0 mg/l well above the Utah state Standard of 5.5 mg/l for warm water fisheries. Utah Lake is currently a nitrogen-deficient system. As such, minor reductions or increase in phosphates waste loads should have little impact on the ecosystem. However, increases in nitrogen may cause algal blooms and nuisance aquatic growths. It should be noted that the highest concentrations of nitrates occur adjacent to the Geneva Steel Works.

Summary

The following observations are made regarding the costs, waste loads, and aquatic impacts associated with wastewater treatment alternatives in Northern Utah County:

- . Alternatives NUC-10, NUC-11, and NUC-12 are not considered viable alternatives because EPA is currently partially funding a 22.9 million dollar wastewater treatment program in Provo.
- . At Level III, Alternatives NUC-2, NUC-6, and NUC-8, and the recommended plan are all equally cost effective.
- . At Level IV, Alternative NUC-9 is the most cost effective.
- . The recommended plan with secondary treatment has an associated cost of only 55 percent of the recommended plan at Level III.
- . Non-point sources are significant sources of BOD, TDS, and TSS.
- . Industrial sources are significant sources of BOD and NO₃.
- . Because Utah Lake is a nitrogen deficient system, increases in NO₃ may cause algal blooms and nuisance aquatic growths.
- . Total waste loads in Northern Utah County should remain fairly constant with only minor changes due to non-point sources. These changes will be the result of changes in land use.

CENTRAL UTAH COUNTY

Central Utah County is comprised of those areas drained by the Lower Provo River, Hobbie Creek and the Spanish Fork River. Provo is the major population center with remaining populations located in Springville, Spanish Fork, Salem, and Payson. The alternatives considered in the Plan include various degrees of regionalization at various levels of treatment. These alternatives, presented in Figure IV-25, are divided into three distinct groups:

- . all plants at Level III treatment
- . all plants at Level IV treatment
- . a combination of Level III and Level IV treatment plants.

Level III alternatives are CUC-2, CUC-4, CUC-6, CUC-7, CUC-9, CUC-10, and CUC-12. Level IV alternatives are CUC-1, CUC-3, CUC-5, and CUC-11. Only CUC-8 considers two levels of treatment.

Cost Analysis

The costs associated with each alternative are presented in Table IV-6. For Level III alternatives, the least expensive plans are CUC-6 (\$24.31/cap/year), CUC-12 (\$24.31/cap/year), and the recommended plan (\$24.22/cap/year). If Level IV treatment is recommended, CUC-5 (\$35.69/cap/year) and CUC-11 (\$35.00/cap/year) are the cheapest. It should be noted that because of the existing program for upgrading and expanding the Provo treatment facility to Level III treatment, the costs and capacity associated with this program are utilized in the economic analysis. This upgrading and expansion includes additional capacity to accommodate the recommended plan. For these reasons, the recommended plan at secondary treatment was not evaluated for Central Utah County.

Waste Load Analysis

Waste loads tributary to Utah Lake and originating in the drainage areas of Central Utah County have been developed for point and non-point sources and are illustrated in Figures IV-26 through IV-30. As in Northern Utah County, Nitrate (NO_3) is used instead of Total Nitrogen (TN).

Non-point and industrial sources comprise 87 to 94 percent of the total BOD waste load in Central Utah County. Therefore, any change in municipal wastewater loadings amounts to only a small change in the overall BOD waste load in the area. Although Total Suspended Solids (TSS) waste loads are significantly different at different levels of treatment, non-point sources account for over 99 percent of the total waste load and, therefore, overshadow any TSS reduction attributable to advanced treatment processes. Similarly, approximately 45 percent of the total Phosphate (PO_4) waste load is attributable to non-point sources, which greatly reduces the overall effect of advanced wastewater treatment.

In consideration of the impact of current plans to implement Level III treatment at Provo, significant non-point contributions, and industrial sources, the total future waste loads for the parameters considered are not significantly different for any alternative. Moreover, total future waste loads either do not change significantly or increase when compared to existing conditions.

FIGURE IV-25

WASTEWATER TREATMENT ALTERNATIVES - CENTRAL UTAH COUNTY

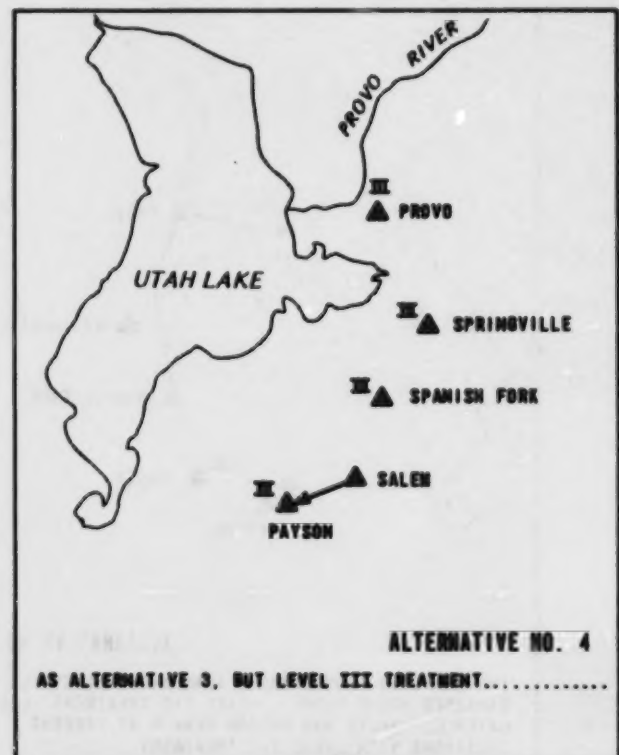
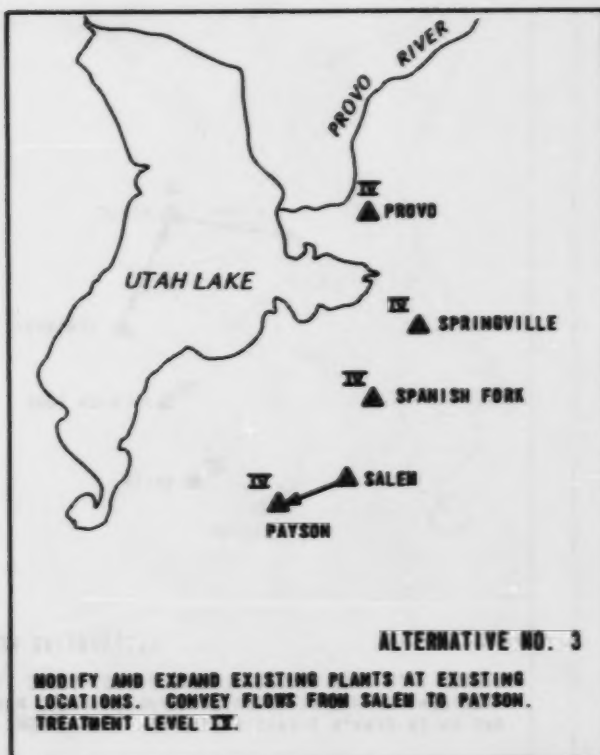
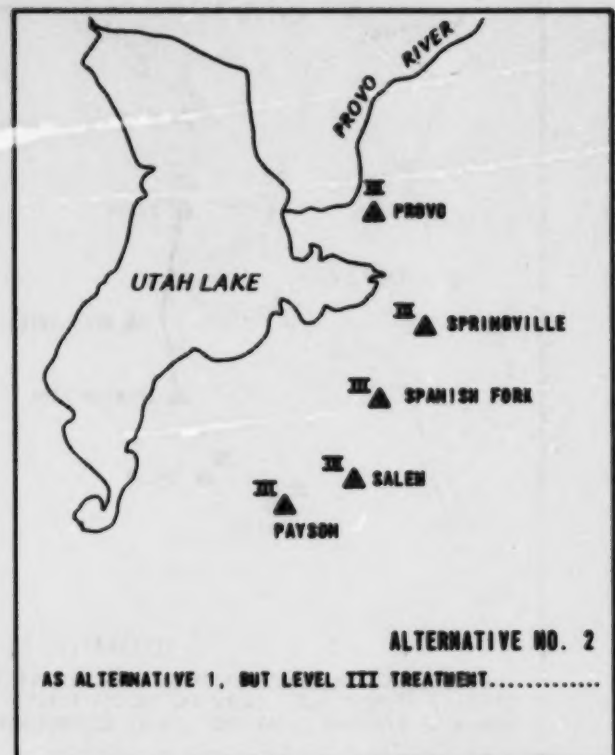
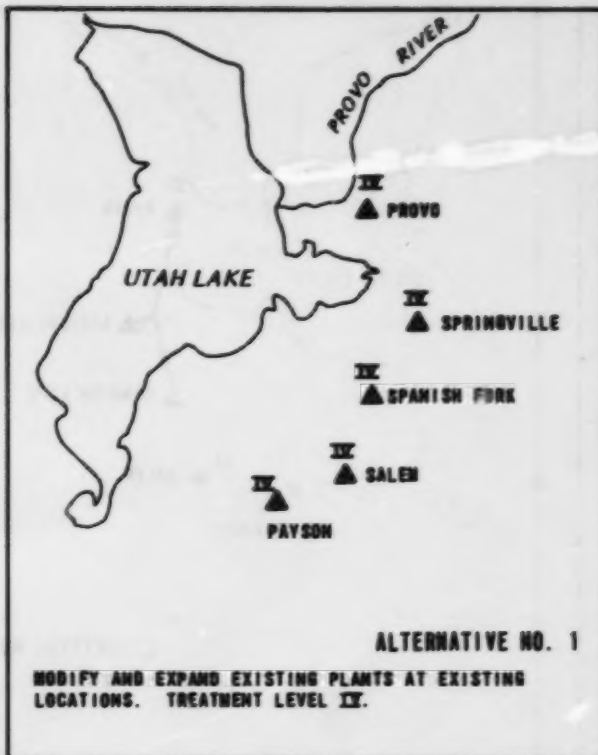


FIGURE IV-25 (Continued)

WASTEWATER TREATMENT ALTERNATIVES - CENTRAL UTAH COUNTY

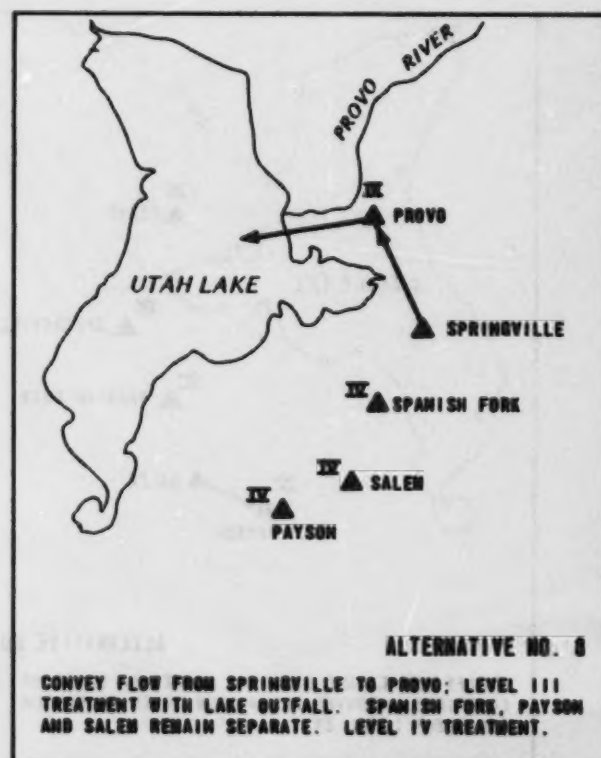
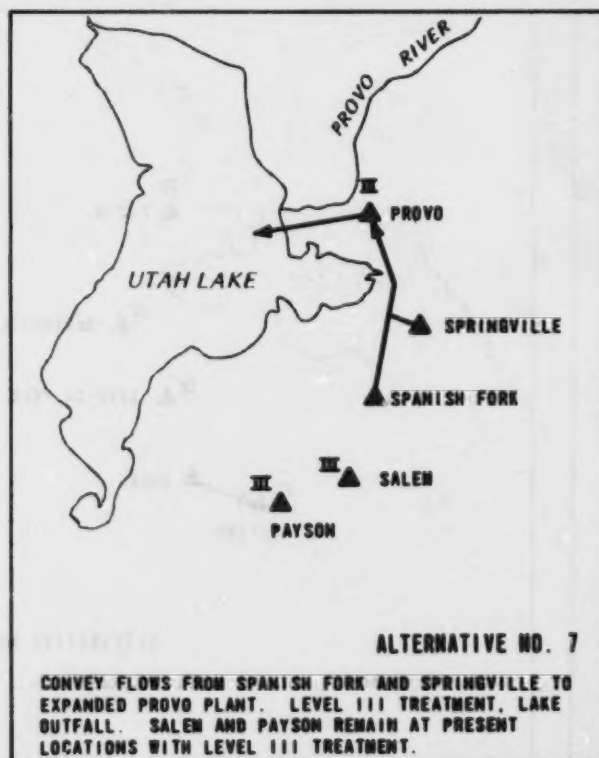
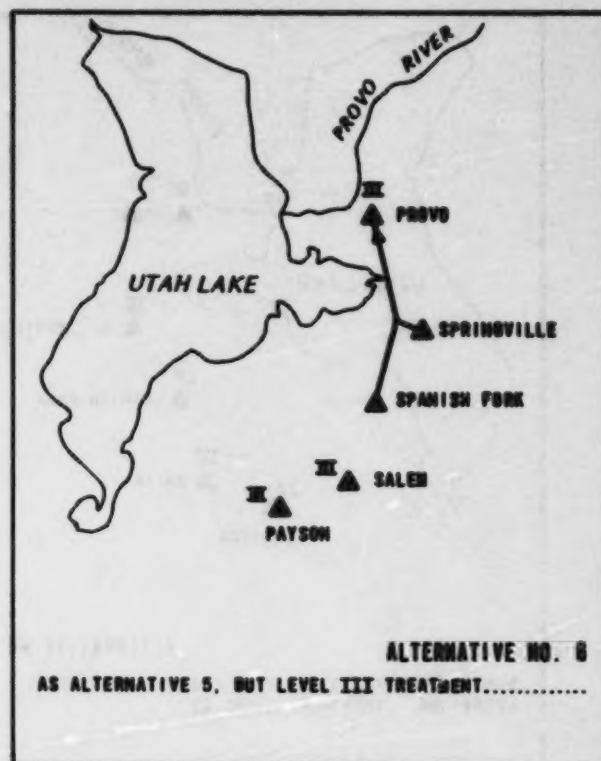
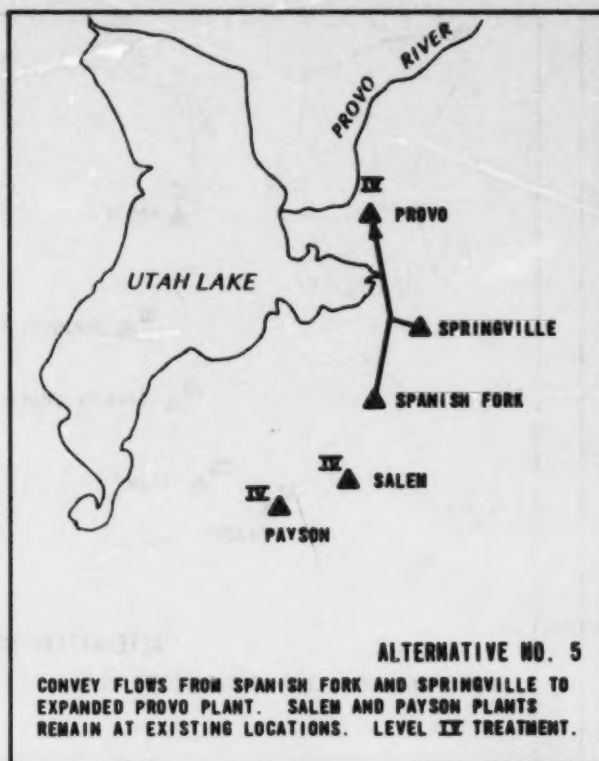


FIGURE IV-25 (Continued)

WASTEWATER TREATMENT ALTERNATIVES - CENTRAL UTAH COUNTY

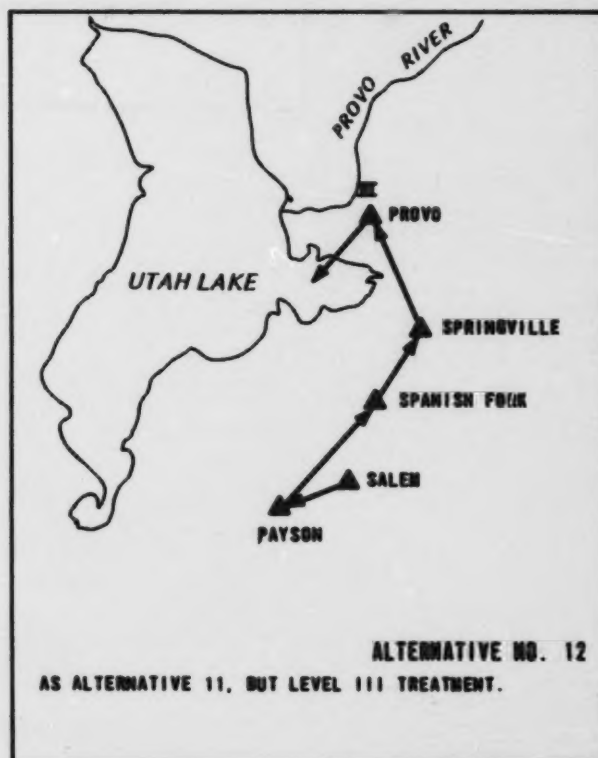
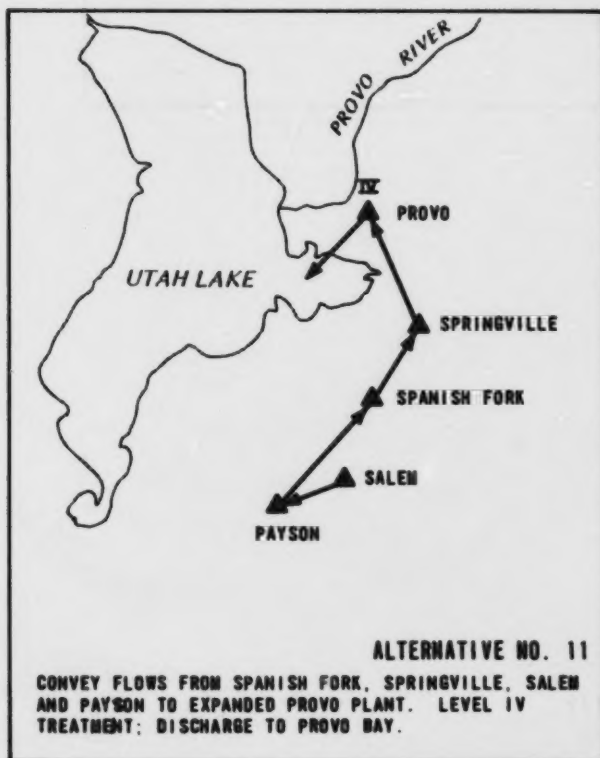
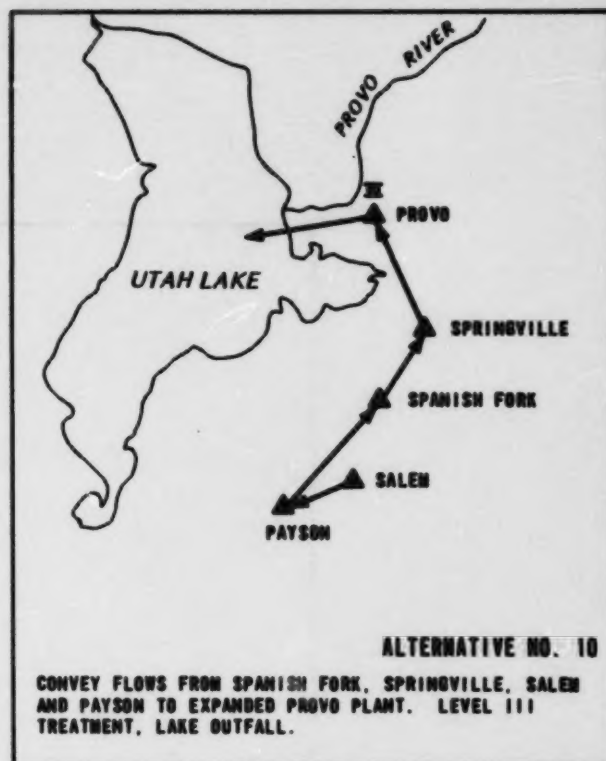
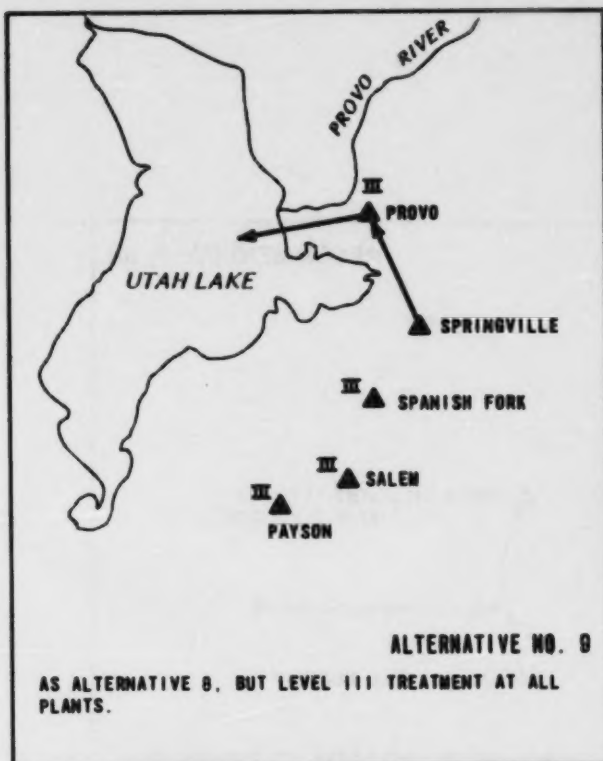


FIGURE IV-25 (Continued)
WASTEWATER TREATMENT ALTERNATIVES - CENTRAL UTAH COUNTY

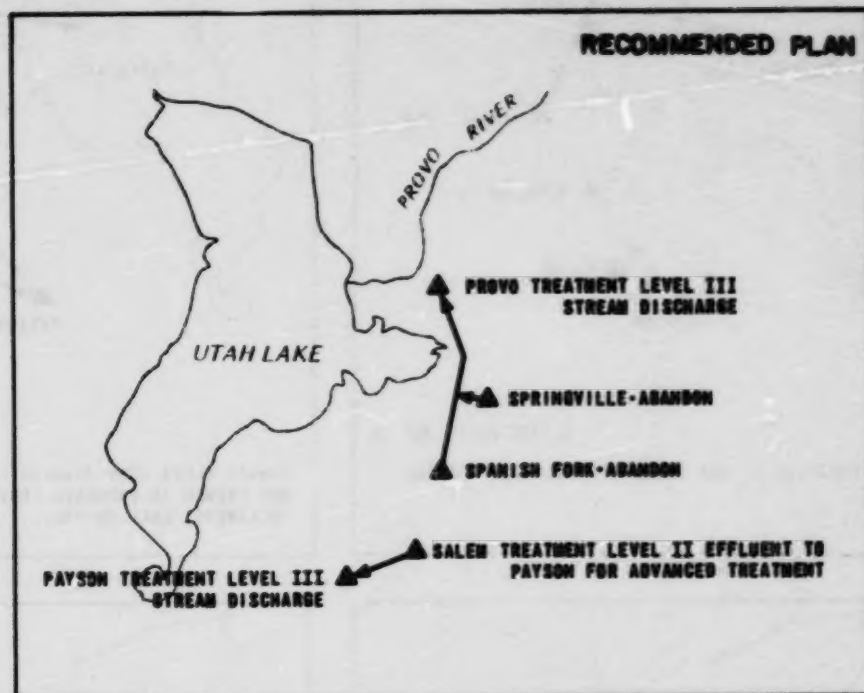


TABLE IV-6
COST ANALYSIS FOR CENTRAL UTAH COUNTY

<u>Categories of Alternatives</u>	<u>Capital Cost (\$106)</u>	<u>Annual Operation & Maintenance Cost (\$106/Yr)</u>	<u>Annual Cost¹ Per Capita (\$/Cap/Yr)</u>
<u>Level III Alternatives</u>			
CUC-2	18.33	1.00	26.66
CUC-4	18.71	0.97	26.56
CUC-6	19.01	0.74	24.31
CUC-7	21.96	0.79	26.86
CUC-9	21.42	0.88	27.44
CUC-10	23.43	0.68	26.67
CUC-12	20.48	0.64	24.31
<u>Level IV Alternatives</u>			
CUC-1	29.31	1.43	41.02
CUC-3	29.64	1.42	41.11
CUC-5	27.54	1.09	35.69
CUC-11	28.28	0.99	35.00
<u>Levels III & IV Alternative</u>			
CUC-8	23.20	0.92	29.49
<u>Recommended Plan</u>			
Level III	19.39	0.71	24.22

¹Actual Cost per Capita is for comparison among alternatives only. They were derived by dividing the total annual cost by the median population between existing conditions and 1995 (Table IV-1). These data are intended to reflect an average cost over the life of the facility and do not represent actual cost per capita nor is the potential for 75 percent Federal funding reflected.

FIGURE IV-26
BOD WASTE LOADS - CENTRAL UTAH COUNTY

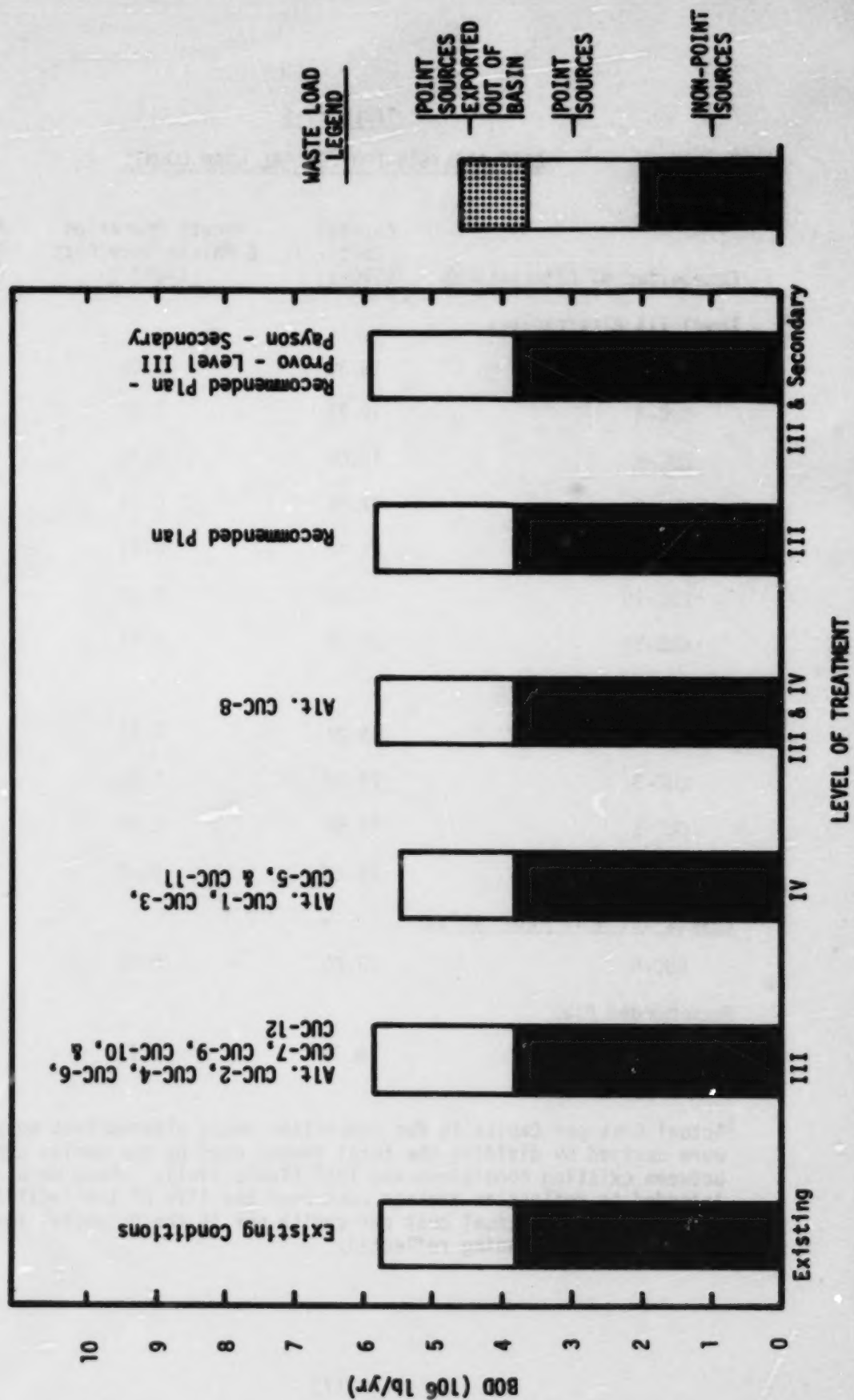


FIGURE IV-27

TDS WASTE LOADS - CENTRAL UTAH COUNTY

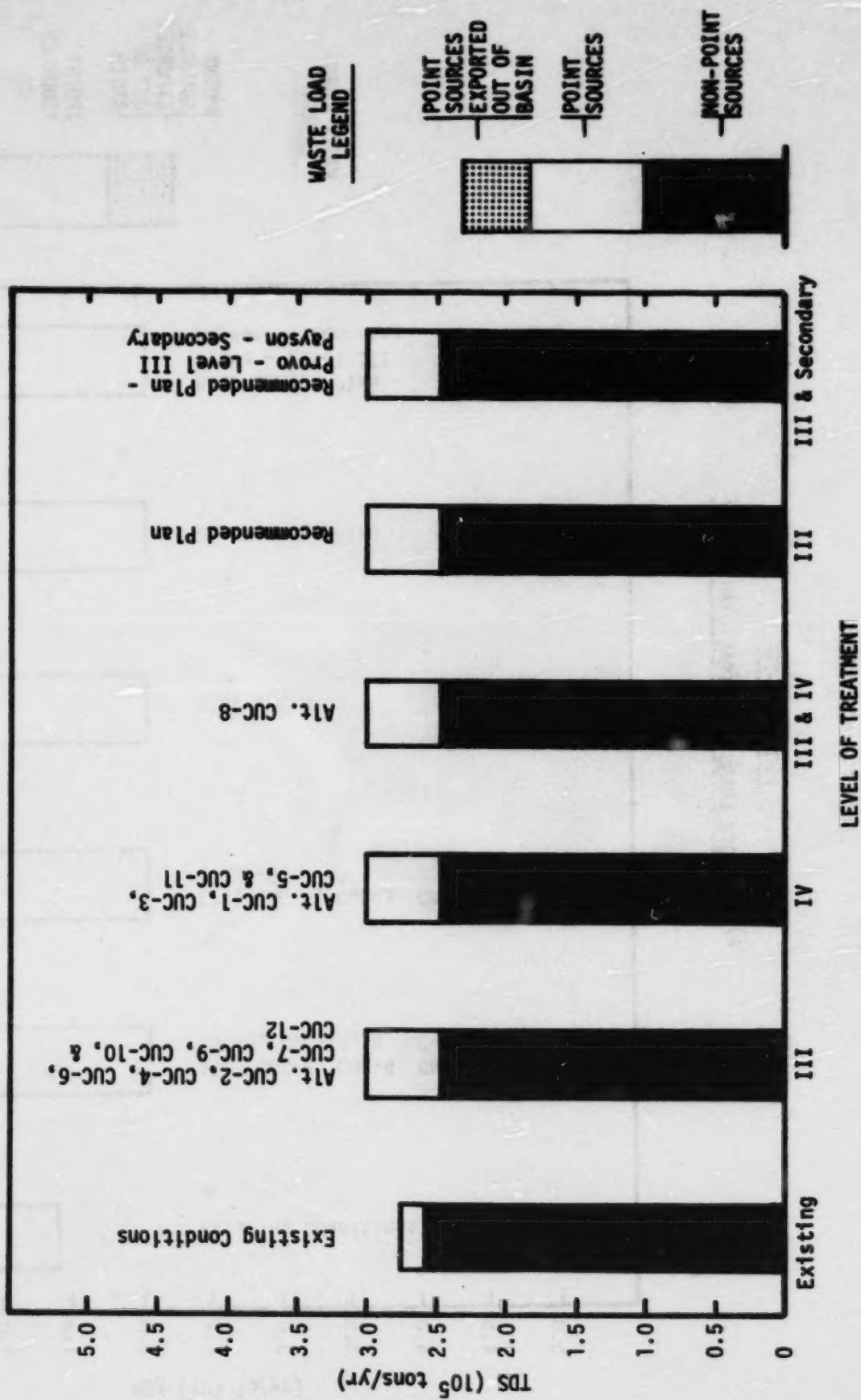


FIGURE IV-28
a) NO₃ WASTE LOADS - CENTRAL UTAH COUNTY

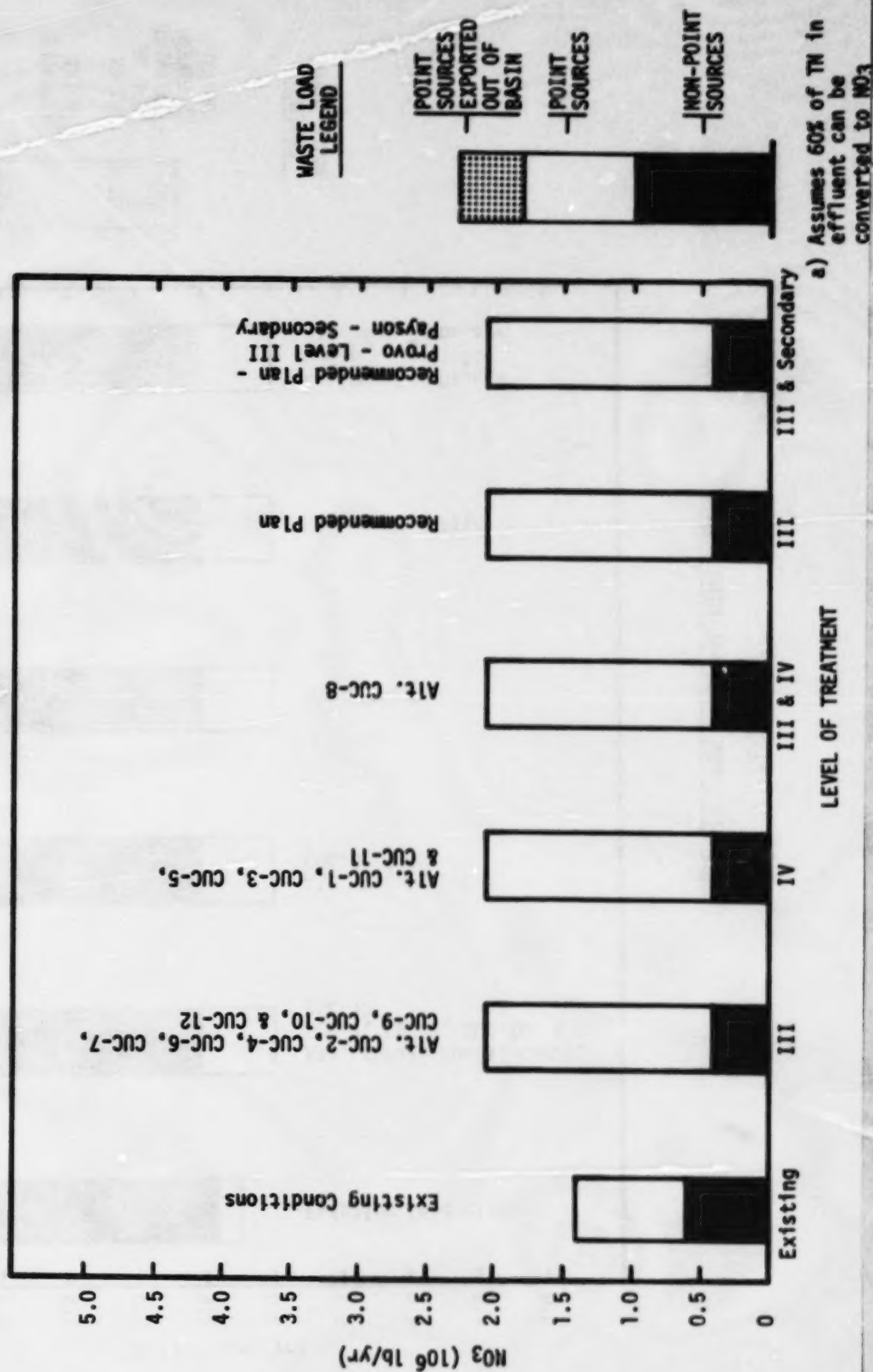


FIGURE IV-29
P04 WASTE LOADS - CENTRAL UTAH COUNTY

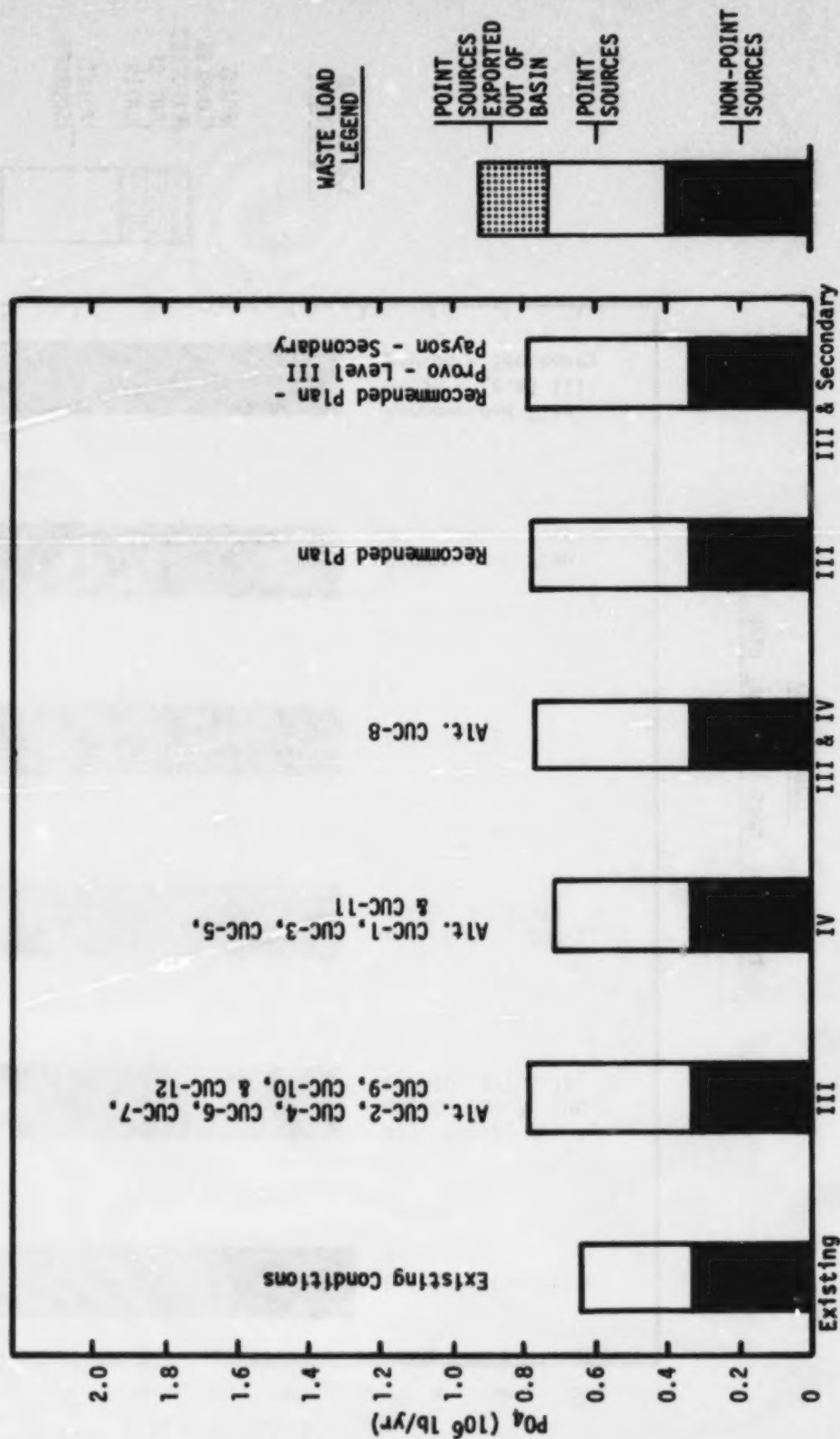
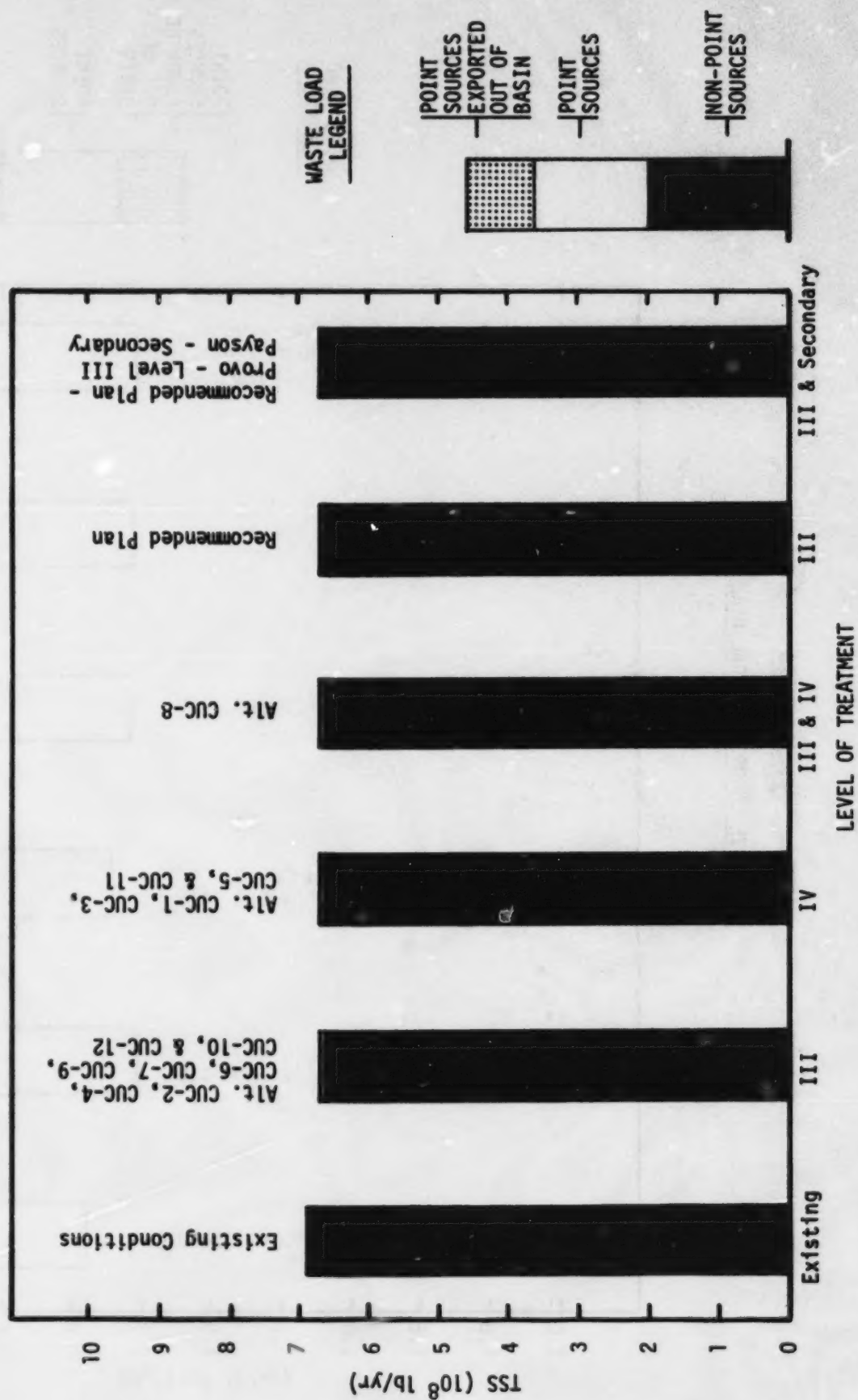


FIGURE IV-30
TSS WASTE LOADS - CENTRAL UTAH COUNTY



Coliform bacteria loadings from point sources can be expected to decrease under all future alternatives because of the strict effluent limitations on coliform bacteria for all levels of treatment considered.

Aquatic Impacts

Based on the water quality data presented in Chapter III, the following statements regarding Utah Lake's aquatic ecosystem can be made:

1. Provo Bay has a distinctively different water quality than the remainder of Utah Lake. DO, BOD, Total Coliform, Phosphates, and NO_3 concentrations are historically higher in Provo Bay than the rest of Utah Lake which borders Central Utah County. Provo Bay is a highly productive system which can assimilate BOD, Phosphates, and NO_3 to form DO and/or food for higher life forms residing in the Bay. This assimilation of waste loads is essential not only to the Bay's productivity, but also to the productivity of the Lake itself.
2. Utah Lake has a nitrogen/phosphorus ratio of approximately 0.2 to 1.0. This low N/P ratio is indicative of a nitrogen deficient system and resulting inhibition of algal growth. A high observed turbidity in the Lake, which significantly reduces photosynthesis, also inhibits algal growth.

Thus, Provo Bay acts to reduce waste loads to the main body of Utah Lake. Within this context, it can be concluded that none of the alternatives appreciably reduce BOD waste loads to the extent which would enhance the existing aquatic habitat. Alternatives CUC-7, CUC-8, CUC-9, and CUC-10 contain a recommendation for a direct discharge to Utah Lake and this direct loading to the Lake may increase the potential for nuisance aquatic growths, because nutrients previously assimilated in Provo Bay would be available to the Lake. Spawning areas at the mouth of Provo Bay could be impacted by changes in water quality due to a Lake outfall, with a subsequent reduction in fish population and/or species. Additionally, a lake outfall can cause localized DO deficits in Utah Lake and/or drastically alter the ecosystem of Provo Bay by depriving it of essential nutrients.

Summary

Based on the previous discussions regarding costs, waste loads, and aquatic impacts of wastewater treatment alternatives for Central Utah County, the following observations are made:

- At Level III treatment, Alternatives CUC-6, CUC-12, and the recommended plan are all equally cost effective.
- At Level IV treatment, Alternatives CUC-5 and CUC-11 are both the most cost effective.
- An EPA funding program to expand and upgrade the Provo treatment facility is currently underway. This program calls for Level III treatment with sufficient capacity to accommodate the recommended plan.
- Future waste loads for all alternatives are identical or have only minimal differences for any single parameter considered.

- . Provo Bay represents a valuable marshland which helps to assimilate waste loads imposed on Utah Lake.
- . Because Utah Lake is a nitrogen deficient system, direct discharges via a lake outfall could contribute to algal blooms and nuisance aquatic growths.
- . In general, if a lake outfall is constructed, the total nature of Utah Lake and Provo Bay may be adversely affected.

WASATCH COUNTY

Wasatch County is comprised of the upper Provo River drainage area tributary to Deer Creek Reservoir. The Heber and Midway wastewater treatment facilities are the only existing sewage works in the area. Six alternative treatment schemes, illustrated in Figure IV-31, are proposed for the area. These alternatives can be aggregated into three groups:

- . Level III Alternatives (WC-2, WC-3, and WC-6)
- . Level IV Alternatives (WC-1 and WC-5)
- . Secondary treatment with subsequent land disposal (WC-4).

Cost Analysis

The costs associated with each of the treatment alternatives are presented in Table IV-7. Although representing vastly different treatment schemes, Alternatives WC-2, WC-4, and the recommended plan all have equal costs, \$30.30/cap/year, which is the minimum cost for all alternatives considered. The recommended plan costs could be reduced by two-thirds if only secondary treatment was required. This large difference is due to the interceptor lines and capital and operation and maintenance cost for the advanced waste treatment at Charleston. If Level IV treatment was required, the most economical system would be WC-1 at \$40.91/cap/year. Costs for WC-6, where all wastes would be exported from the basin to Provo are \$50.00/cap/year for the interceptor (costs assigned to persons connected to the interceptor) and \$32.30/cap/year for the Provo treatment plant (costs assigned to all persons connected to the plant) for a total cost of \$82.30/cap/year.

Waste Load Analysis

Point and non-point waste loads for Wasatch County are illustrated in Figures IV-32 to IV-36. Non-point sources currently contribute between 56 and 98 percent of the total waste load for those parameters considered. Because future development is limited, the future non-point sources pollution is expected to be almost identical to existing conditions. In terms of total waste loadings, future BOD, Total Nitrogen (TN), and Phosphate (PO₄) loads are less than existing conditions. However, the impact of advanced waste treatment on these reductions can be misleading. In actuality, future waste loads were estimated by assuming the massive infiltration/inflow problem in the Heber Valley would be resolved. Thus, even with more people, future waste flows and, hence, loadings will be less than existing if development occurs as predicted. It should also be noted that although future total area waste loads are less than existing loadings, where these wastes are discharged has a significant impact on the surface

FIGURE IV-31

WASTEWATER TREATMENT ALTERNATIVES - WASATCH COUNTY

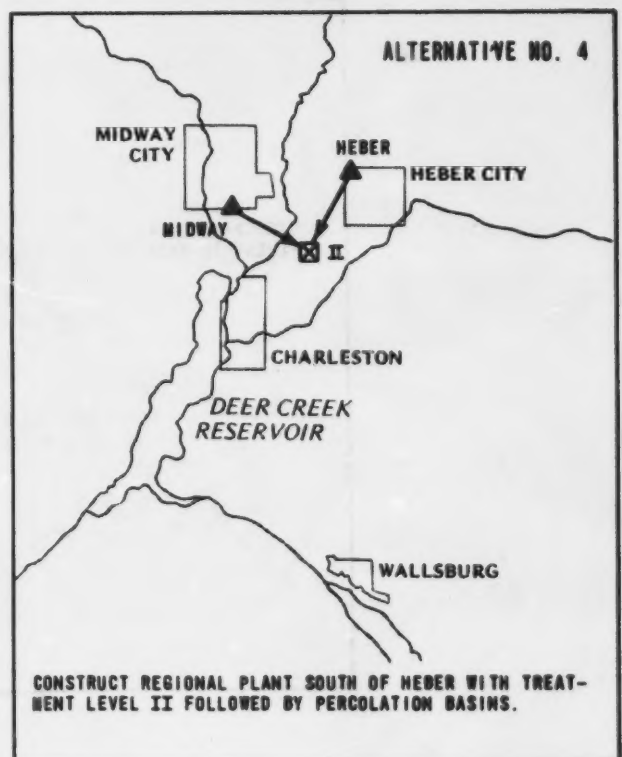
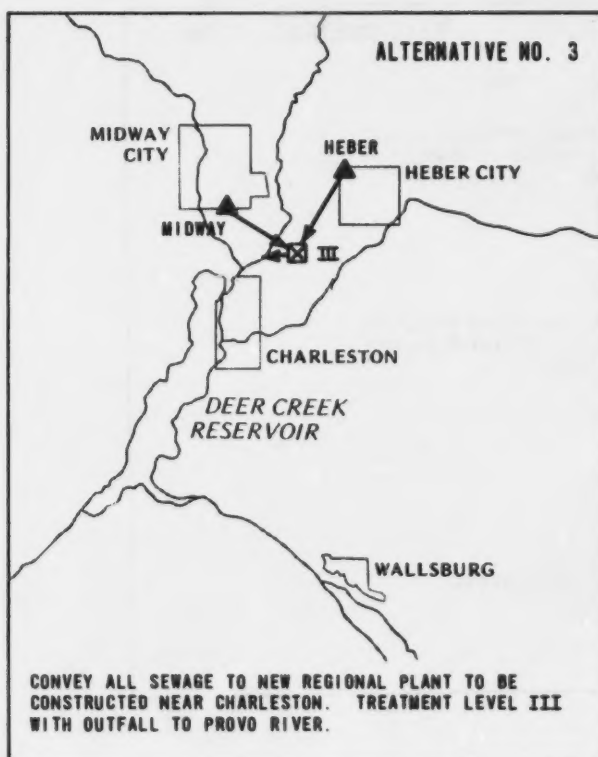
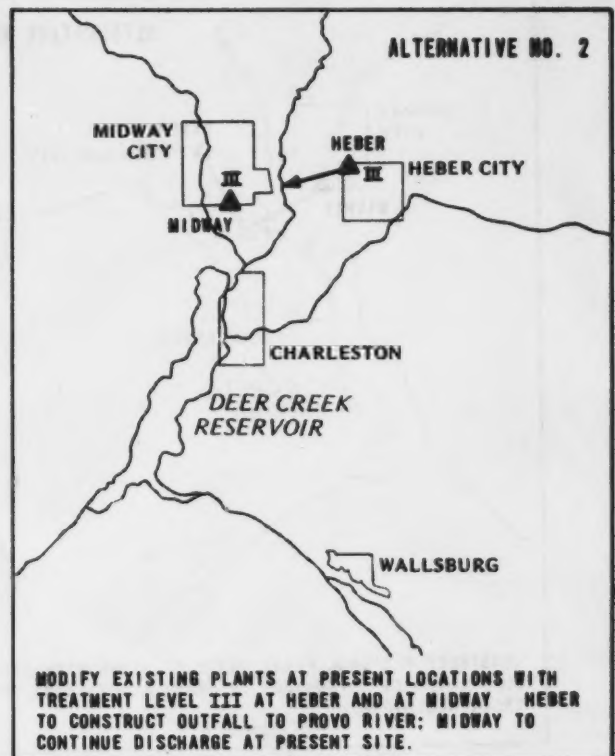
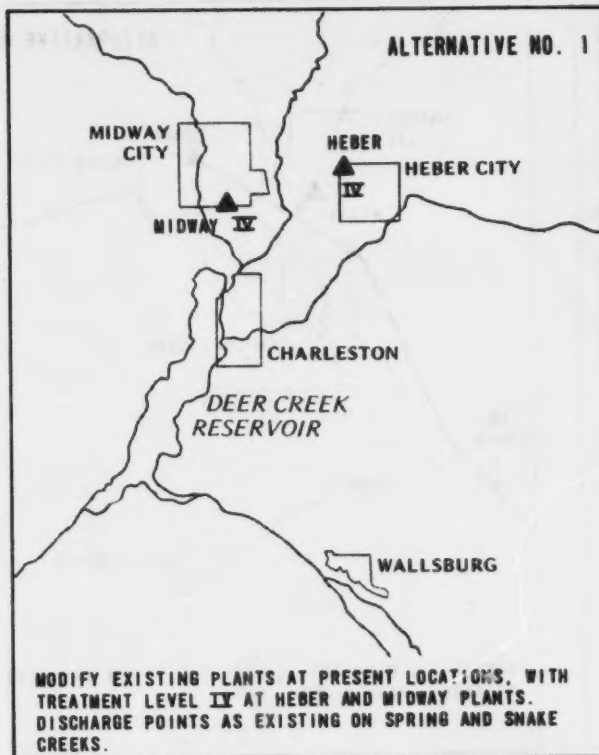


FIGURE IV-31 (Continued)

WASTEWATER TREATMENT ALTERNATIVES - WASATCH COUNTY

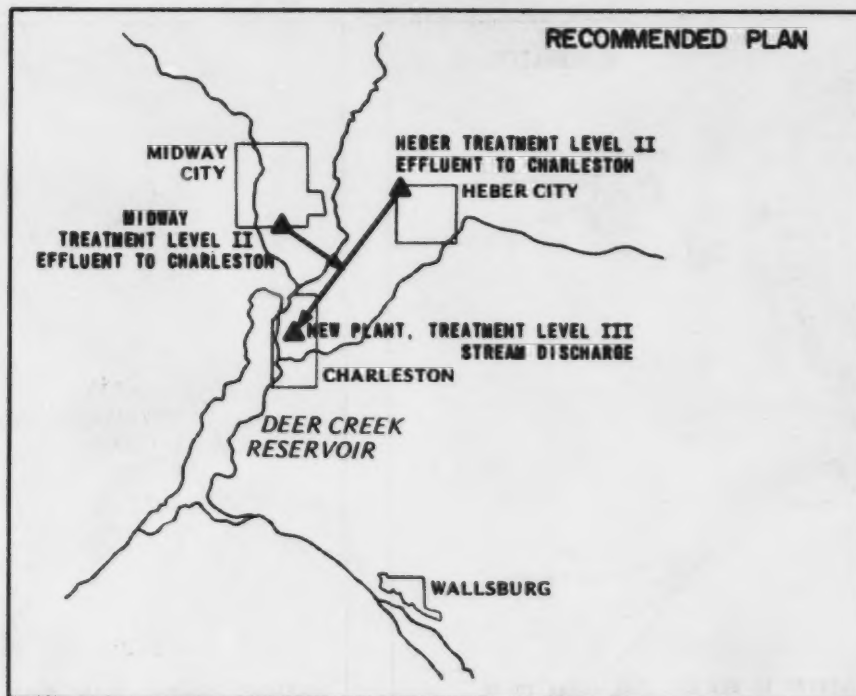
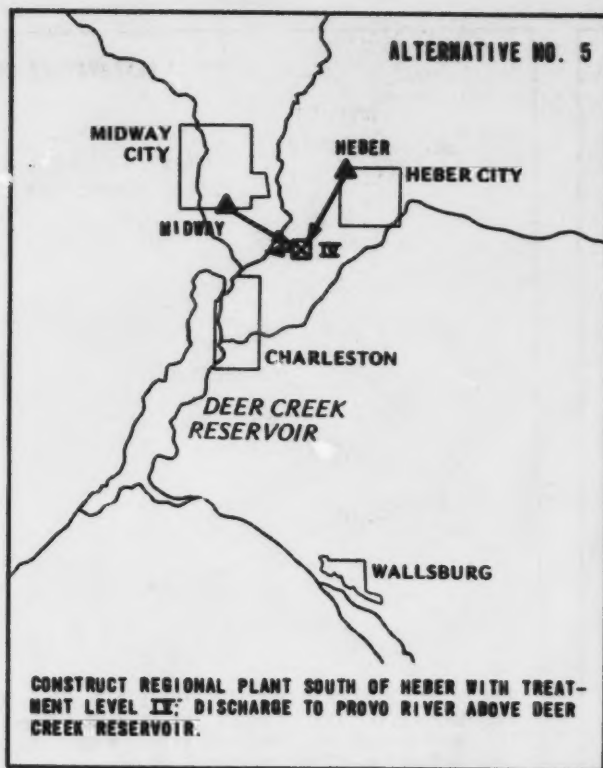


TABLE IV-7

COST ANALYSIS FOR WASATCH COUNTY

<u>Categories of Alternatives</u>	<u>Capital Cost (\$10⁶)</u>	<u>Annual Operation & Maintenance Cost (\$10⁶/Yr)</u>	<u>Annual Cost Per Capita (\$/Cap/Yr)</u>
<u>Level III Alternatives</u>			
WC-2	0.85	0.12	30.30
WC-3	1.93	0.10	40.91
<u>Level IV Alternatives</u>			
WC-1	1.38	0.14	40.91
WC-5	2.65	0.12	54.55
<u>Secondary Treatment with Land Disposal</u>			
WC-4	1.59	0.06	30.30
<u>Convey Flows to Provo with Level III Treatment</u>			
WC-6 a) Interceptor	4.65	0.02	50.00
b) WWTP	1.39	0.05	<u>32.30</u>
TOTAL			82.30
<u>Recommended Plan</u>			
Level III	0.95	0.12	30.30
Secondary	0.00	0.07	10.61

¹Annual Cost per Capita is for comparison among alternatives only. They were derived by dividing the total annual cost by the median population between existing conditions and 1995 (Table IV-1). These data are intended to reflect an average cost over the life of the facility and do not represent actual cost per capita nor is the potential for 75 percent Federal funding reflected.

a) Costs totally funded by Heber Valley populace.

b) Heber Valley's proportionate share of wastewater treatment at Provo.

FIGURE IV-32

BOD WASTE LOADS - WASATCH COUNTY

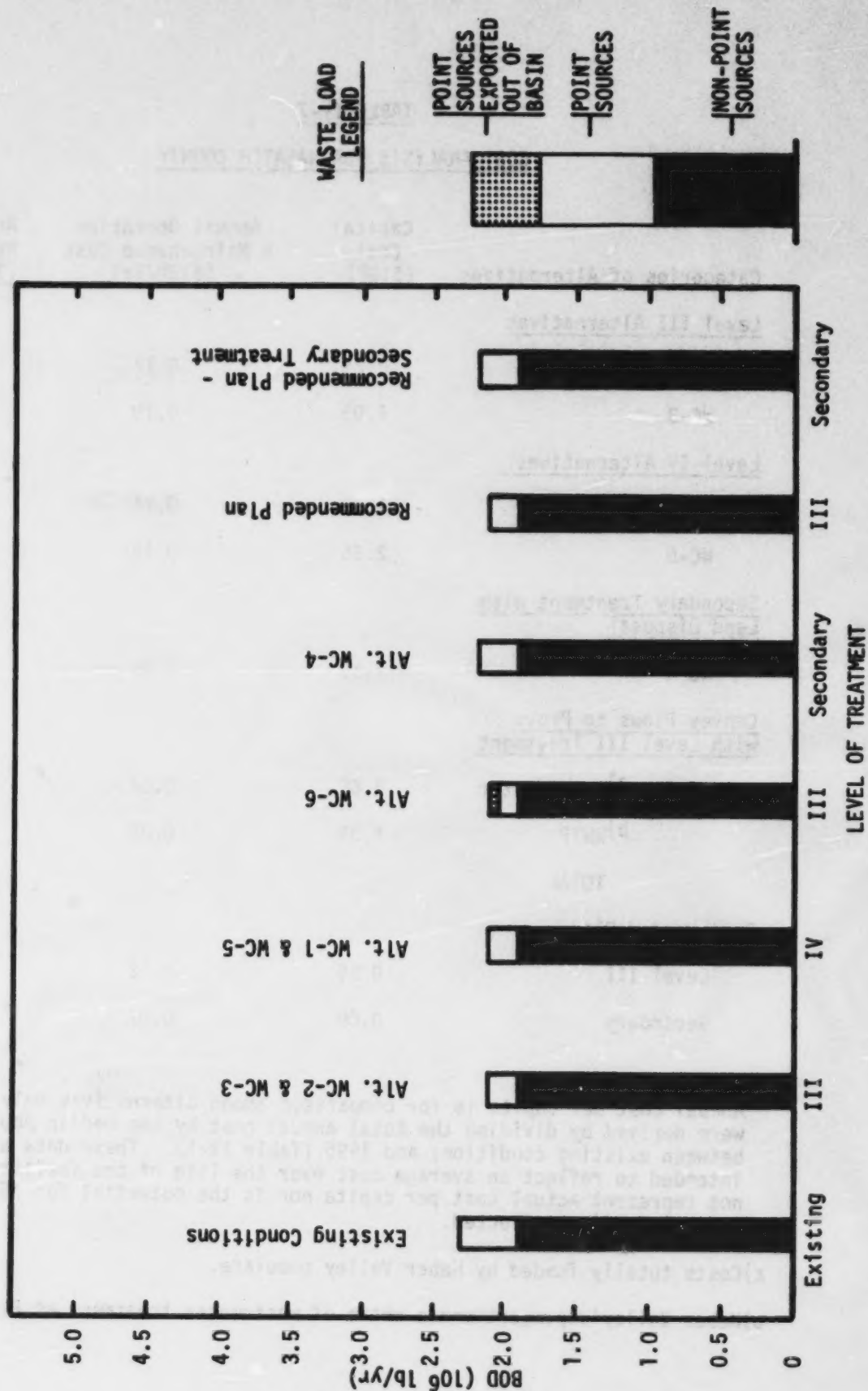


FIGURE IV-33

TDS WASTE LOADS - WASATCH COUNTY

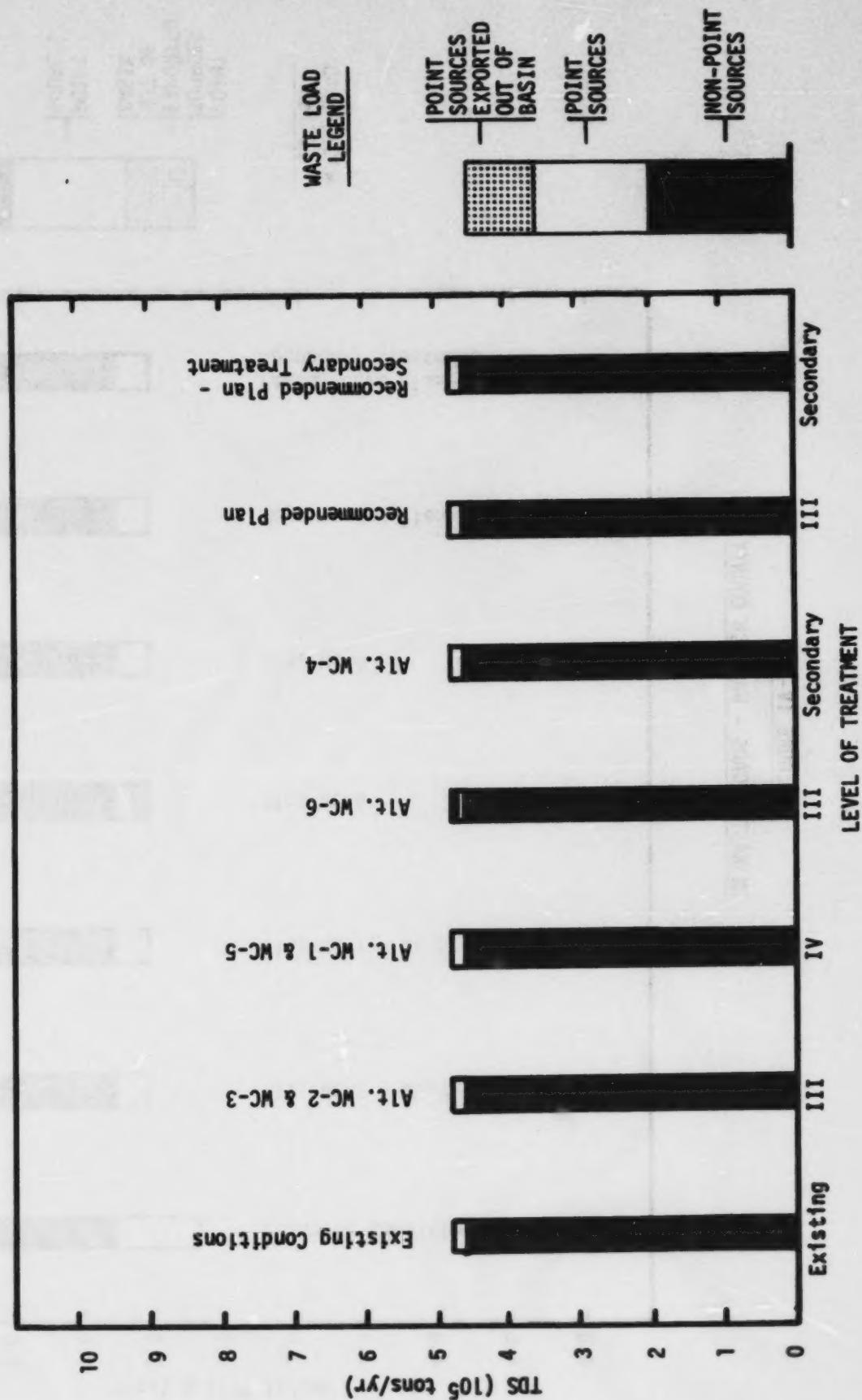


FIGURE IV-34
TN WASTE LOADS - WASATCH COUNTY

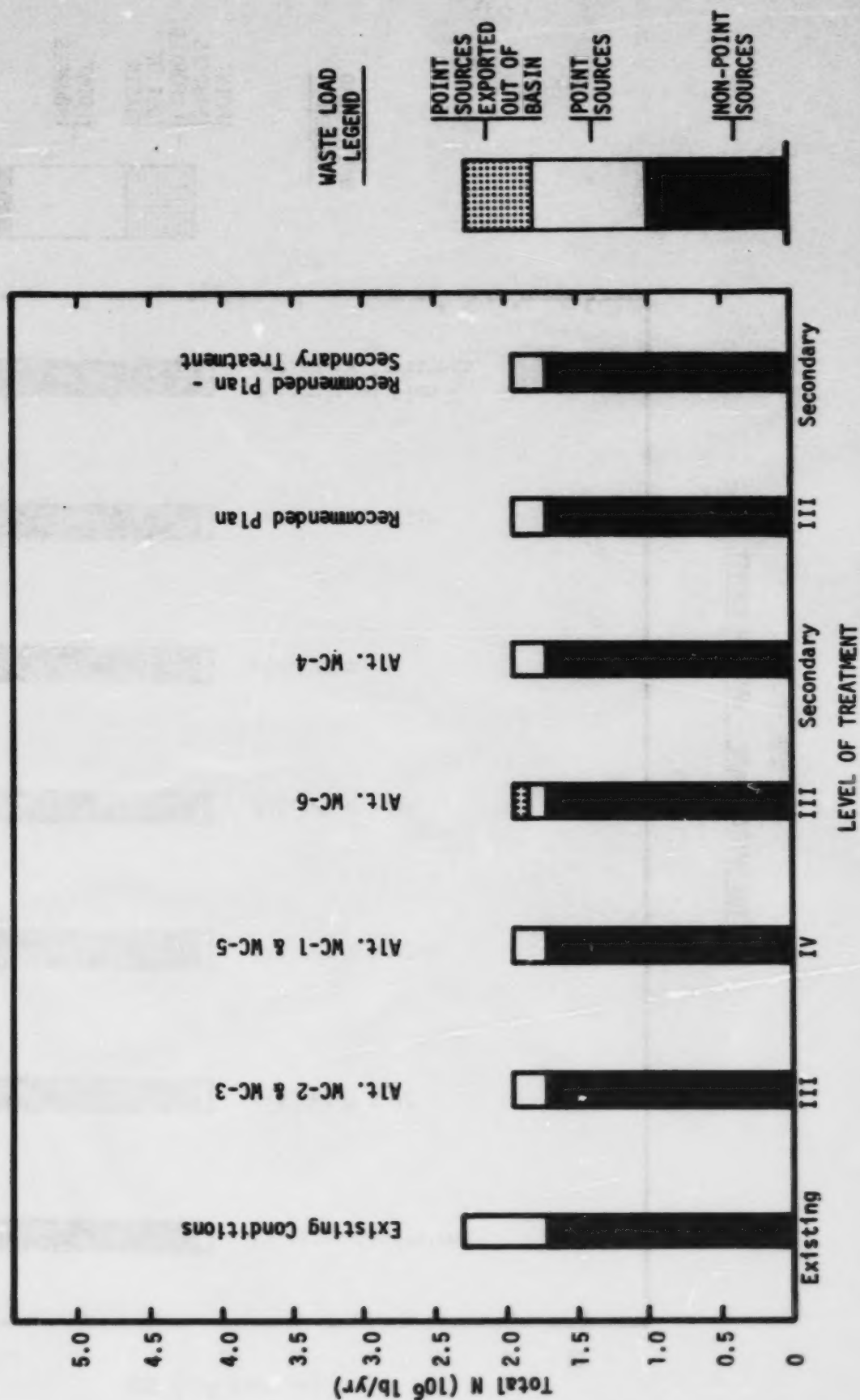


FIGURE IV-35

P04 WASTE LOADS - WASATCH COUNTY

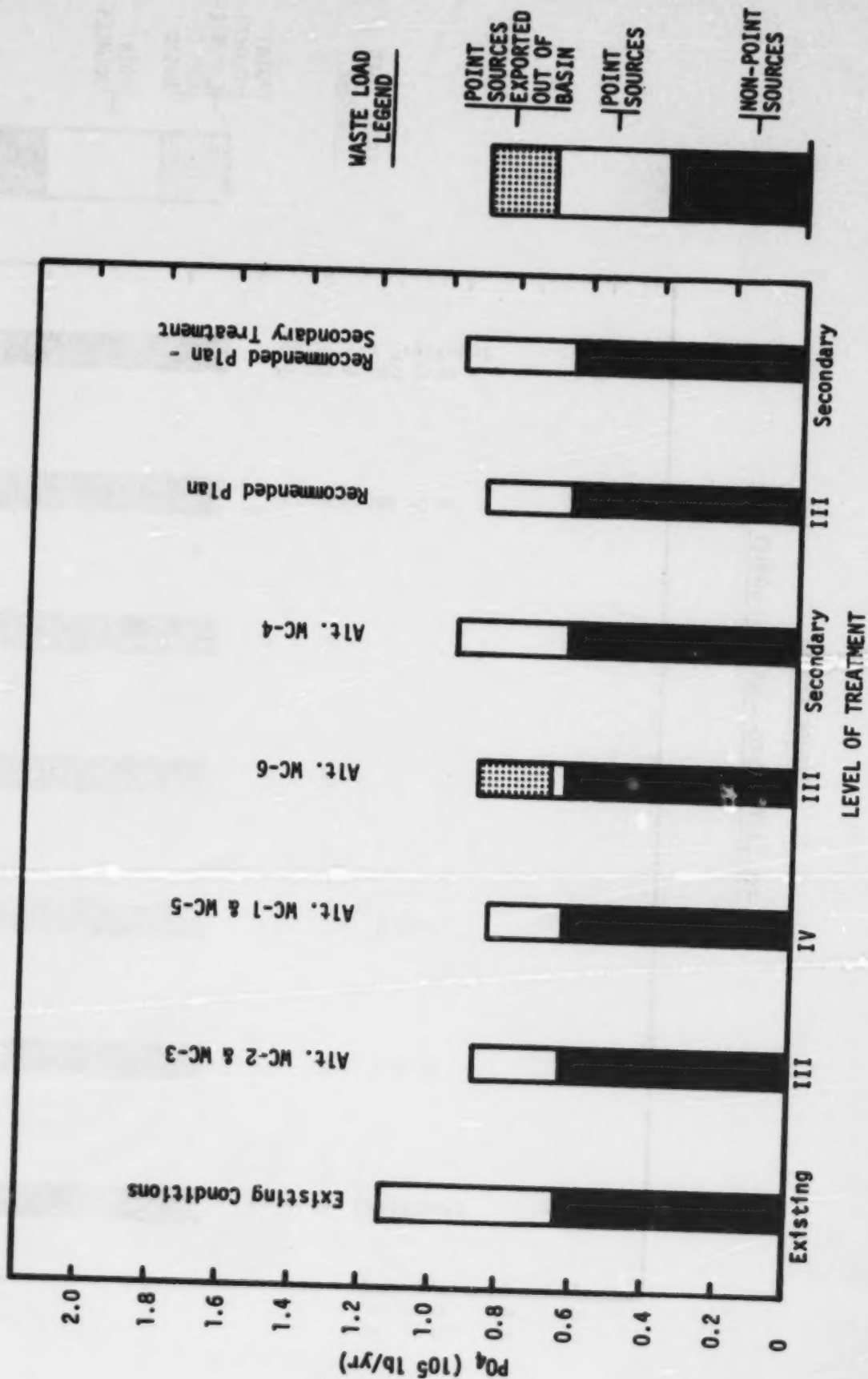
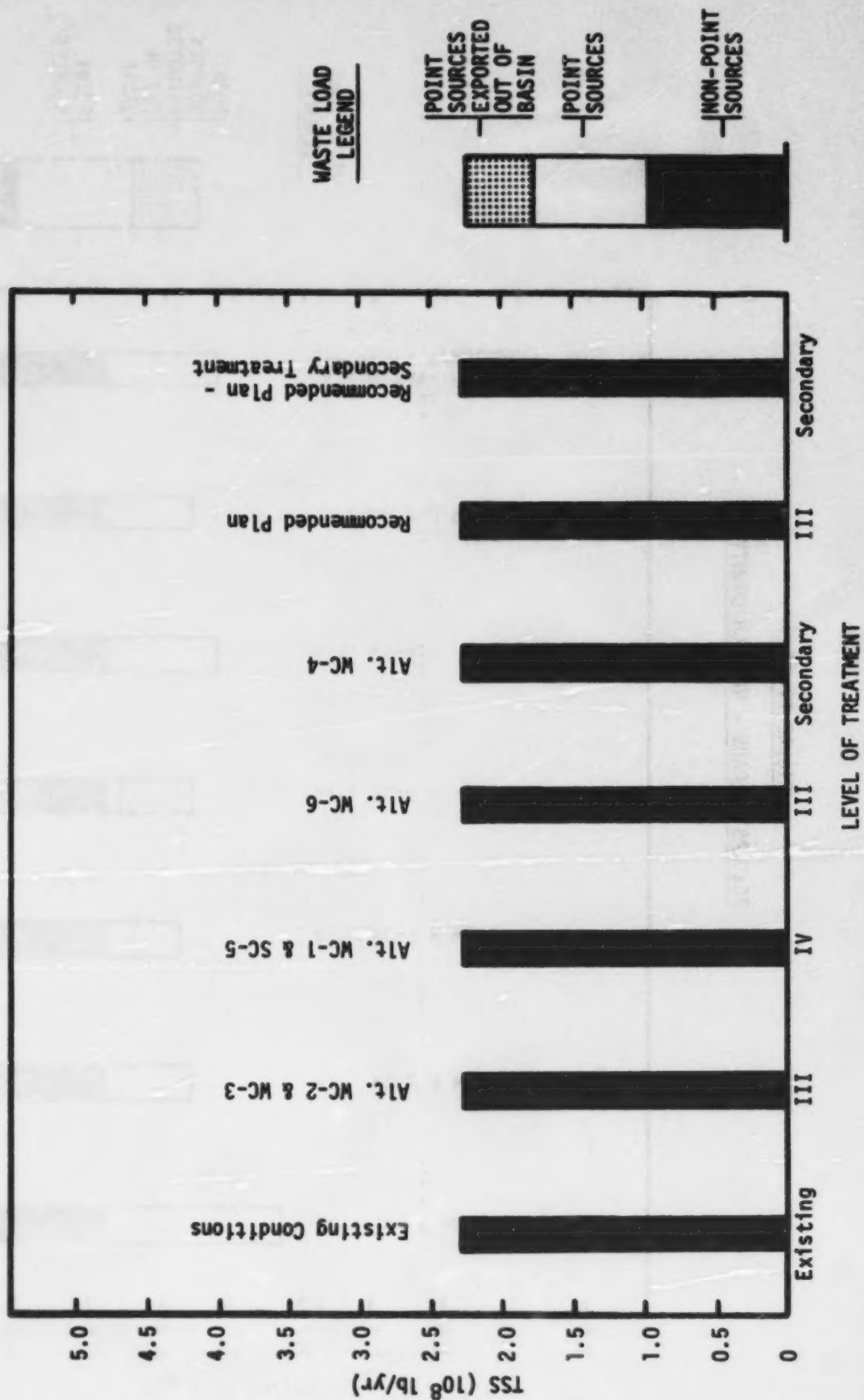


FIGURE IV-36
TSS WASTE LOADS - WASATCH COUNTY



waters used for water supplies. That is, all alternatives except WC-6 require discharges in or above Deer Creek Reservoir. Because the Reservoir is a source of raw water for Salt Lake City and a potential source for Orem and Provo, these alternatives may have a deleterious impact on that use.

Aquatic Impacts

The aquatic impacts of the alternative wastewater treatment schemes are extremely difficult to assess for Wasatch County because of the almost total lack of water quality data in this area. From what little information is available, it can be concluded that Alternative WC-2 with its discharge of Heber effluent to the Provo River may enhance the aquatic habitat of Spring Creek, but at the expense of the Provo River. Additionally, the closer the discharge of wastewaters to Deer Creek Reservoir, the higher the potential for nutrient enrichment of the Reservoir.

Alternative WC-4 contains a recommendation for secondary treatment and land disposal. The groundwater table in Wasatch County is extremely high and waste loads imposed on the land for assimilation may adversely affect the quality of the groundwater.

Summary

The following observations can be made regarding the costs, waste loads, and aquatic impacts associated with alternative wastewater treatment systems for Wasatch County:

- . The recommended plan is the most economical alternative.
- . Alternatives WC-2 and WC-4 have costs equivalent to the recommended plan but for vastly different configurations.
- . The recommended plan with secondary treatment is one-third the cost of the same plan with Level III treatment.
- . Because of substantial non-point waste loads, relatively small differences in total waste loads for any single parameter occur between alternatives.
- . Alternative WC-4 may adversely affect groundwater quality.
- . Alternatives WC-2, WC-3, WC-5, and the recommended plan may improve the aquatic habitats of Spring Creek but at the expense of the Provo River.

LEGAL IMPLICATIONS

A significant problem associated with the implementation of any wastewater treatment alternative in the Study Area is the impact on existing water rights. Existing water law in the Study Area can be summed up in the following:

- . Utah water law is founded on the Colorado Doctrine of prior appropriation; i.e., "First in time - first in right."
- . Water law in Utah is an adjudicatory process rather than a statutory process. Thus, the fundamentals of prior appropriation are derived from legal actions, not from legislative actions.
- . Water rights in the Study Area are highly complex and not clearly definable.

Given these fundamentals, it is impossible to pre-judge the nature of water rights problems which could develop from implementation of any wastewater treatment alternative. This can be accomplished only through judicial processes. Thus, to define the potential legal impacts, several different treatment scenarios are offered together with the resulting possible water rights implications.

No Change Scenario

This scenario includes those alternative treatment schemes whereby some or all existing facilities are maintained and simply upgraded and expanded to accommodate additional wastewater flow and/or treatment. Also, discharges are at existing treatment plants. In this situation, no water rights problems are expected to develop from discharge locations.

Regionalization Scenario

This scenario includes those wastewater treatment alternatives which require consolidation of two or more existing treatment facilities. If an appropriator downstream of an abandoned discharge is adversely affected by consolidation, he may enter into litigation to halt plan implementation. The jurisdiction or authority embracing the regionalized area may take any of the following recourses:

- . enter into litigation to implement the project
- . purchase that portion of the appropriator's water right which is affected
- . transfer another water right to satisfy the appropriator's need
- . implement consolidation and pump back that portion of the appropriator's water right which is affected
- . do not implement the plan.

Transfer of Point of Discharge Scenario

Changes in effluent discharge locations are addressed in this scenario. The impact on downstream water users is similar to that in the previous scenario. A downstream appropriator may enter into litigation because his water right would be committed elsewhere. The jurisdiction or authority may exercise any of the following options:

- . enter into litigation to implement project
- . purchase the water rights affected by the transfer
- . substitute the transferred water with another water right
- . do not implement the project.

There are also water quality implications in an effluent transfer scenario. In a 1954 decision, the 2nd District Court of Utah (Salt Lake City v. Boundary Springs Water Users Association, 2 Utah 2d 141, 144, 270 p. 2d 453, (1954)) stipulated, "The owner of a water right has a vested right to the quality as well as the quantity which he has beneficially used." Thus, water users downstream of the new discharge location have legal recourse if they feel their water rights have been preempted through quality degradation.

Recycle-Reuse and Land Disposal Scenarios

Recycle-reuse and land disposal are two alternatives not precisely addressed in the Plan, but that are being more seriously considered as further technological advances are made. As such, these alternatives could have serious impacts on water rights. Implementation of either of these options may interfere with an appropriator's surface or ground-water rights and lead to litigation. Actions by the appropriate jurisdiction or authority may include:

- . enter into litigation
- . purchase that portion of the appropriator's water right affected by the alternative
- . supply the appropriator with another water right
- . do not implement project.

CHAPTER V

LAND RESOURCE IMPACTS

OVERVIEW

Land resource impacts resulting from implementation of any Plan alternative wastewater management scheme can be divided into impacts on:

- . land uses
- . financial and economic resources
- . terrestrial ecosystem
- . historical and archaeological sites
- . social systems.

Within each of these categories, environmental impacts may be termed:

- . beneficial or adverse
- . short term or long term
- . reversible or irreversible
- . direct or indirect.

Beneficial or adverse impacts are often easily definable (i.e., degrades water quality vs doesn't degrade water quality) yet subjectiveness still exists within this impact characterization. What may be a beneficial impact to an industrialist may be an adverse impact to a farmer. Short term vs long term impacts are also clearly definable. Extending sewage outfall across a marshland may cause short term impacts on the sensitive ecosystem while continual discharge of sewage at the edge of the marsh may create long term problems.

Reversible and irreversible impacts are sometimes harder to define. Certainly building a sewage treatment plant or interceptor produces certain irreversible impacts at least over the life of the project. Reversible impacts may include the commitment to a certain treatment level with the option to go to land disposal or some other treatment level in the future.

Direct or indirect impacts can be identified in terms of land use. Destruction of an historical site from construction of an interceptor is a direct impact. If the historical site is destroyed from induced growth, that is an indirect impact. Except for land committed to construction of wastewater management systems, most land use impacts can be viewed as indirect.

LAND USE IMPACTS

All of the treatment alternatives discussed in Chapter III were based on a common land use plan also presented in Chapter III. Thus, it is difficult to identify differences in land use impacts on a basin basis resulting from implementation of alternative treatment plans. This is not to say that the Plan does not have regional land use impacts or that any treatment alternatives does not have more localized impacts. Because of this situation, land use impacts are presented in terms of direct impacts (environmental responses to alternative implementation) and indirect impacts (environmental responses to effects caused by alternative implementation).

Indirect Impacts

Indirect land use impacts are best evaluated in terms of the land use policies articulated for the Study Area. The following is a brief summary of land use policies contained in available county comprehensive plans.

The Davis County Master Plan (October 1970) contains basic land use policies addressing agriculture and urban sprawl:

1. Agricultural lands, not needed for urban use should be maintained in parcels large enough for efficient crop production.
2. Urban development should be confined to areas within the existing 16 municipalities and which have well drained to moderately drained soils and slopes not exceeding 20 percent. Urbanization of unincorporated areas is not recommended.
3. Urban sprawl, the fragmentation of agricultural land into small parcels and leap-frog residential development, is the number one enemy of agriculture.
4. The rural flavor of the County should be preserved.

The 1985 Salt Lake Valley Plan (1965) contains the following basic land use policies for developing areas of Salt Lake County:

1. Agriculture is an important industry in the Valley and should be protected and maintained where the following circumstances exist:
 - a. where the best soil is found and water is available
 - b. when urbanization would be detrimental to the County's physical and economic well being.
2. Where feasible, non-agricultural land should be used for urban expansion.

The Salt Lake Comprehensive Plan made other statements which represent land use recommendations:

1. Adequate land exists within the then current urbanizing area to accommodate projected 1985 population growth, without further encroachment into prime agricultural areas.
2. The prime agricultural belt lies south and southwest of the urbanizing area. It should be retained as agricultural use.

Utah County has recently, in 1975, updated the land use element of their Master Plan. Although policies are not specifically outlined, the basic plan objectives and recommendations identify land use proposals. The basic elements of these proposals include:

1. Urban development should occur in the following sequence:
 - a. First, in municipalities
 - b. Second, in areas surrounding municipalities on land best suited for urban purposes
 - c. Third, in existing unincorporated urban communities within those areas served by water systems
 - d. Fourth, in unincorporated communities that are not served by water systems, but in which a significant number of non-farm homes have already been constructed; and,
 - e. Fifth, a limited number of bona fide new towns in the unincorporated area of the County.

2. Indiscriminate leap-frogging of subdivision and non-farm development is discouraged.
3. Preserve agricultural land by encouraging only bona fide agricultural uses and certain other ancillary uses to be constructed and maintained on lands that are most appropriately suited for agricultural use.
4. Urban centers are to be separated from each other by a belt of cropland, grazing land, or other open space.
5. Priorities for use of Provo Canyon are:
 - a. Watershed
 - b. Recreation
 - c. Transportation
 - d. Agriculture
 - e. Commerce
 - f. Industry (extractive)
 - g. Housing
6. The Provo Canyon land use goal is: Encourage the use of land in a way that will (1) protect the health and safety of nearby residents, (2) preserve the unique and unusual natural features for future generations, and (3) promote the desires and economic needs of present property owners.

The Wasatch County Comprehensive Plan (1974) includes the following policies related to land use:

1. Development within the mountains should be clustered in a manner that will preserve scenic values, conform to health and sanitation standards, preserve and protect the flora and wildlife of the surrounding area, and minimize soil erosion.
2. The Wasatch County Council of Governments should adopt and implement the type of urban form in Heber Valley that is characterized by compactly built communities surrounded by green belts. In other words, the municipalities and the county should declare that future urban development should take place within cities and towns where essential services are already available, or where they can be provided and maintained at the least possible cost.
3. The Council of Governments should also adopt and implement the type of urban form in the mountainous areas that is characterized by compactly built clusters of vacation-type houses surrounded by large areas of open range and forest lands.

In total, these land use policies encourage protection of agricultural land, urban centers separated by open space, and development of existing urban areas. The policies discourage indiscriminate leap-frogging of residential development, fragmentation of agricultural uses, and urban sprawl. There seems to be ample evidence that existing land use has not been regulated in conformance with these policies. Thus, without stricter land use management, urban sprawl and pocket development can be expected to continue.

Because the wastewater treatment alternatives contained in the Plan were based on a specific land use plan (see Chapter III), the alternatives

can be thought of as inducing or accommodating that specific level of development delineated by the land use plan. The level of information contained in the land use plan is not sufficiently detailed to permit any assessment of basin-wide impacts from induced growth; however, the location of interceptor lines and available treatment capacity of a service area certainly will influence the location of development within the Study Area. Without strict land use controls, interceptors constructed in previously unsewered areas can influence strip development along the interceptor, resulting in increased costs for vacant or agricultural lands because of land speculation, scattered urban land development, and/or leap-frog residential growth and urban sprawl. Such development patterns are likely to create adverse impacts including the permanent loss of agricultural lands, increased demands for all types of urban services (schools, parks, roads, utilities, police and fire protection, etc.), and the escalation of the decline of the local agricultural economy from inflated land values and taxes. Sprawl development can increase driving and commuting costs, air pollution, and increased storm-water runoff and associated pollutants resulting in both a greater amount and lower quality of water in local streams. Under this type of development pattern, natural woodlands and wildlife habitats may be eliminated or substantially altered due to the intrusion of housing projects or other urban uses. Besides endangering wildlife, considerable recreation and tourist values may be lost or limited. Additionally, visual identity is frequently lost, that is, it becomes increasingly more difficult to visually identify one community from its neighbor if boundaries are mutually shared and a rural area between the two does not exist.

All wastewater treatment alternatives which include major interceptors are presented in Table V-1 together with the potential impacts resulting from the types of development which may occur without strict land use management. Upon review of these alternatives in Davis and Utah Counties, it can be concluded that regionalization in these counties could induce development of agricultural land leading to adverse impacts such as the reduction of agricultural land, increased transportation-related problems, increased runoff, and loss of wildlife habitat. Regionalization in Salt Lake County will probably have minimum adverse impact because treatment alternatives considered already cross developed land or are in areas where development will probably occur regardless of interceptor location. Consolidation in Wasatch County has potential adverse impacts in terms of lost agricultural land, increased runoff, and loss of wildlife habitat. In addition, the proposed alternatives which include a major interceptor through Provo Canyon will increase the rate of development and density of development in the area, creating potential adverse impacts such as loss of wildlife habitat and vegetative cover, erosion due to increased runoff, aesthetic degradation, and demand for other services.

Direct Impacts

Direct land use impacts include those localized impacts from treatment plant construction and operation. These impacts include noise from

TABLE V-1
ALTERNATIVES INCLUDING MAJOR INTERCEPTOR CONSTRUCTION AND
POSSIBLE LAND USE IMPACTS

<u>Alternative</u>	<u>Area of Influence</u>	<u>Comments</u>
DC-5	Agricultural land between Central and North Davis STP	Potential for strip development and adverse land use impacts are high.
DC-6	Same as DC-5	Same As DC-5.
DC-7	Agricultural land between South Davis South and South Davis North STP	Potential for strip development and adverse land use impacts are high.
DC-8	Same as DC-7	Same as DC-7.
DC-9	Agricultural land between South Davis South and Central Davis STP	Potential for strip development and adverse land use impacts are high. Also would adversely impact Farmington Bird Refuge.
DC-10	Agricultural and industrial land between South Davis South and Salt Lake City STP	Potential for industrial development high but adverse land use impacts minimal because some of the area already has industrial development.
DC-11	Same as DC-10	Same as DC-10.
DC-12	Agricultural and industrial land between South Davis North and Salt Lake City STP	Between South Davis North and South Davis South STP impacts same as DC-7; between South Davis South and Salt Lake City STP impact same as DC-10.
DC-13	Same as DC-12	Same as DC-12.
Davis County Recommended Plan	Same as DC-7	Same as DC-7.

TABLE V-1 (Continued)
ALTERNATIVES INCLUDING MAJOR INTERCEPTOR CONSTRUCTION AND
POSSIBLE LAND USE IMPACTS

<u>Alternative</u>	<u>Area of Influence</u>	<u>Comments</u>
SLC-3	Industrial land in area of Granger-Hunter, South Salt Lake, Salt Lake SSD #1, Cottonwood, and Murray STP	Impacts minimal.
	Agricultural and residential land between Sandy and Tri-Community	Potential for urban development west of facilities high but adverse impacts low because infilling will probably occur in area without interceptor.
SLC-4	Same as SLC-3	Same as SLC-3.
SLC-5	Agricultural and residential land between Sandy and Tri-Community STP	Same as SLC 3 impacts in this area.
	Industrial land in area of Granger-Hunter, South Salt Lake SSD-1, Cottonwood, and Murray STP	Same as SLC-3 impacts in this area.
SLC-6	Same as SLC-5	Same as SLC-5.
	Agricultural lands north of Tri-Community	Will influence residential development in this area but development will most likely occur without interceptor.
SLC-7	Same as SLC-6	Same as SLC-6.
	Industrial strip between South Salt Lake and Salt Lake City STP	Will encourage further industrial development but will have minimal adverse land use impacts.
SLC-8	Same as SLC-7	Same as SLC-7.
SLC-9	Same as SLC-5	Same as SLC-5.

TABLE V-1 (Continued)
ALTERNATIVES INCLUDING MAJOR INTERCEPTOR CONSTRUCTION AND
POSSIBLE LAND USE IMPACTS

<u>Alternative</u>	<u>Area of Influence</u>	<u>Comments</u>
SLC-10	Same as SLC-6	Same as SLC-6.
SLC-11	Same as SLC-7	Same as SLC-7.
SLC-12	Same as SLC-6	Same as SLC-6.
SLC Recommended Plan	Same as SLC-10	Same as SLC-10.
NUC-5	Agricultural land along northern edge of Utah Lake	Will encourage development outward from existing communities; significant impact on agricultural lands.
NUC-6	Same as NUC-5	Same as NUC-5.
NUC-7	Same as NUC-5	Same as NUC-5.
NUC-8	Agricultural land along northern edge of Utah Lake	Same as NUC-5.
	Industrial land (Geneva Steel) between Pleasant Grove & Orem	Land is already in heavy industry - no significant impacts.
NUC-9	Same as NUC-8	Same as NUC-8.
NUC Recommended Plan	Same as NUC-5	Same as NUC-5.
CUC-3	Agricultural land between Salem and Payson	Could encourage development of agricultural land - significant impact.

TABLE V-1 (Continued)
ALTERNATIVES INCLUDING MAJOR INTERCEPTOR CONSTRUCTION AND
POSSIBLE LAND USE IMPACTS

<u>Alternative</u>	<u>Area of Influence</u>	<u>Comments</u>
CUC-4	Same as CUC-3	Same as CUC-3.
CUC-5	Agricultural land north of Spanish Fork to Provo	Could encourage development of agricultural land - significant impact.
CUC-6	Same as CUC-5	Same as CUC-5.
CUC-7	Same as CUC-5	Same as CUC-5.
CUC-9	Agricultural land between Springville and Provo	Could encourage development of agricultural land - significant impact.
CUC-10	Agricultural land east of Utah Lake	Could encourage development of agricultural land - significant impact.
CUC-11	Same as CUC-10	Same as CUC-10.
CUC-12	Same as CUC-10	Same as CUC-10.
CUC Recommended Plan	Same as CUC-10	Same as CUC-10.
WC-3	Agricultural land in Heber Valley	Could encourage development of agricultural land - significant impact.
WC-4	Same as WC-3	Same as WC-3.
WC-5	Same as WC-3	Same as WC-3.

TABLE V-1 (Continued)
ALTERNATIVES INCLUDING MAJOR INTERCEPTOR CONSTRUCTION AND
POSSIBLE LAND USE IMPACTS

<u>Alternative</u>	<u>Area of Influence</u>	<u>Comments</u>
WC-6	Agricultural land in Heber Valley	Could encourage development of agricultural land - significant impact.
WC Recommended Plan	Provo Canyon	Major impact in Canyon from development.
	Same as WC-3	Same as WC-3.

construction equipment and operational equipment, dust, odors, aesthetics, and the psychological impact of living near a treatment facility. Each existing facility was assessed in terms of existing adjacent land uses and the probable increased encroachment due to future land use.

Considering the above context, existing and probable future adjacent land use impacts were evaluated in terms of the proximity of the treatment plant to residential and non-residential (industrial and commercial) land uses. The following criteria were established:

- . Severe (S) - 0 to $\frac{1}{4}$ mile separation. Significant potential for construction and operation related impacts. Aesthetic, odor, and psychological impact is extreme.
- . Severe to Moderate (S/M) - $\frac{1}{4}$ to $\frac{1}{2}$ mile separation. Facility is still close enough to existing residential land use to create significant adverse impact and potential exists for increased encroachment in the future.
- . Moderate to Negligible (M/N) - $\frac{1}{2}$ to 1 mile separation. Sufficient vacant land exists between the facility and surrounding residential land to buffer adverse impacts or surrounding land use is compatible, non-residential use. Additionally, there is some room for expansion of facility and/or increased development without serious encroachment.
- . Negligible (N) - 1 or more miles separation. Little or no existing or future adverse impact expected.

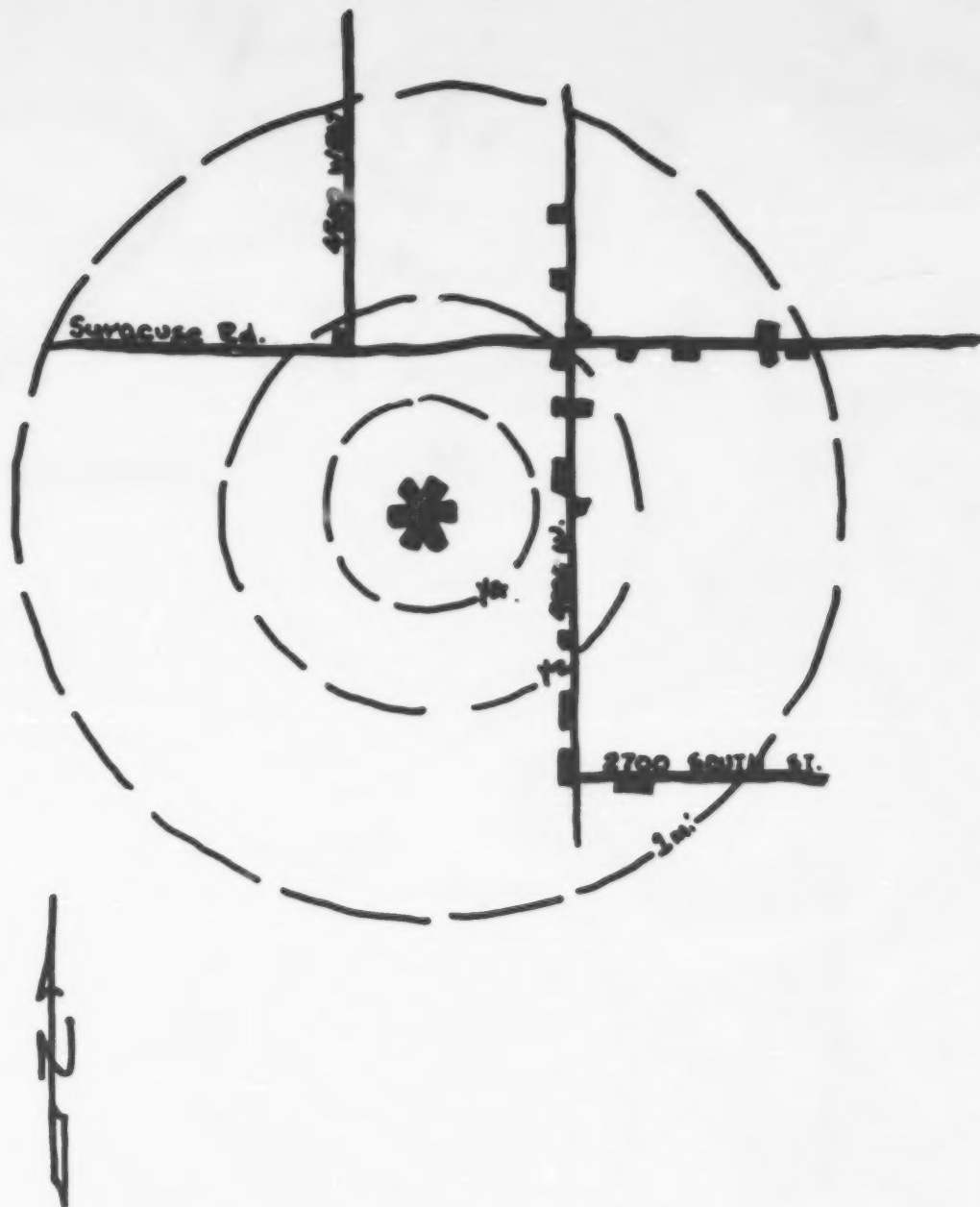
An asterisk (*) is used to denote emphasis. For example, M*/N indicates that the impact is more likely to be "moderate" than "negligible." This was used to indicate slight increases in impact at treatment plants when they are specified as regional facilities accepting wastes from abandoned facilities.

Adjacent land use impacts for the various treatment alternatives based on the above criteria are presented in Tables V-2 through V-6 and discussed in the following.

Davis County

The existing adjacent land uses for Davis County wastewater treatment plants are illustrated in Figures V-1 to V-4 and impacts are presented in Table V-2. All of the Davis County alternatives will create or expand adjacent land use conflicts. However, overall the problems do not appear to be critical. Residential development, although nearby in some instances, is sparsely developed, rural large lot homes, and farms. As long as these residential densities do not become more intense, any of the alternates would appear to be acceptable based on adjacent land use conflict analysis.

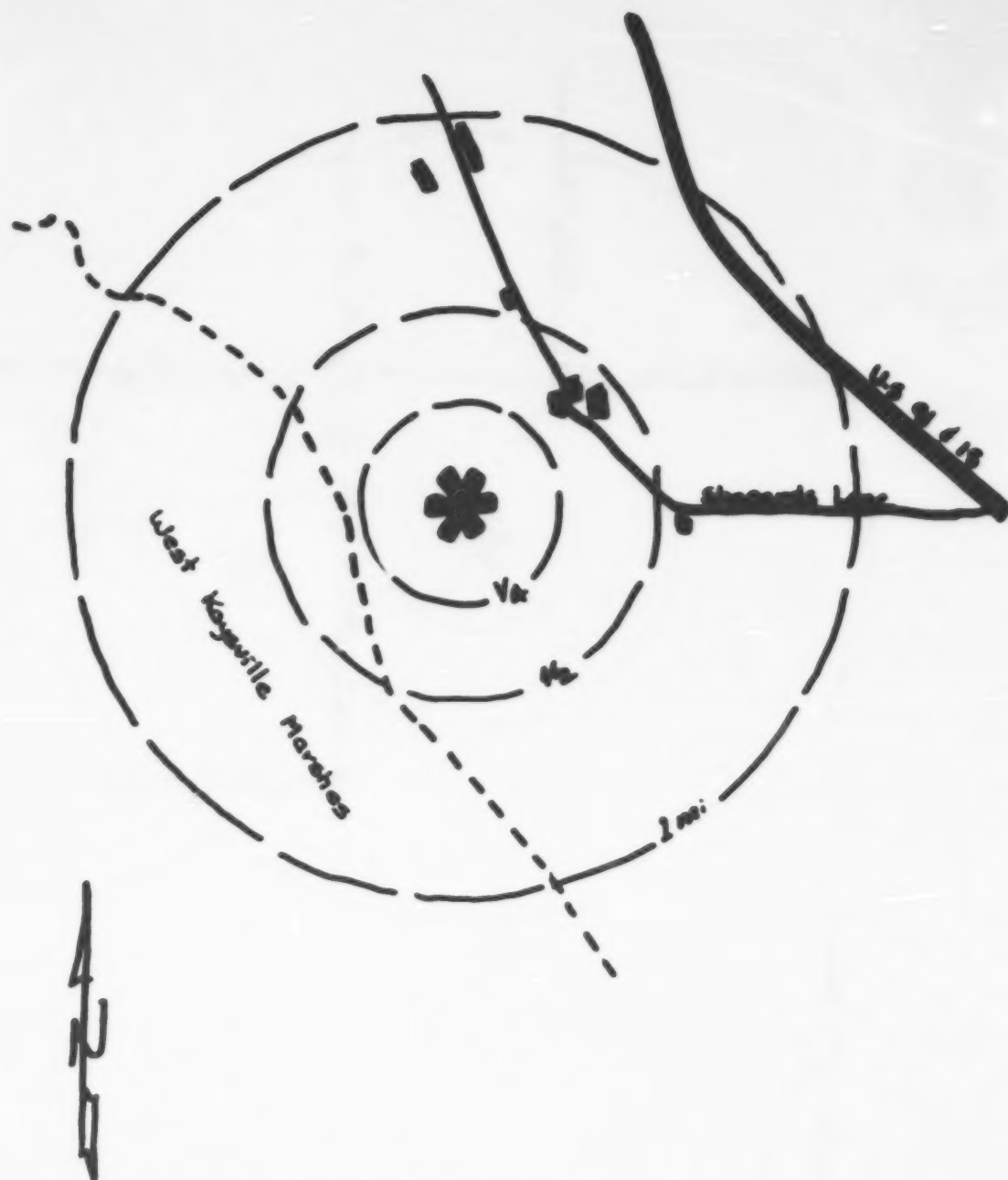
The North Davis and Central Davis facilities will have severe to moderate adverse impacts under all Davis County alternatives except DC-5 and DC-6 where Central Davis is abandoned. There is some residential development within $\frac{1}{4}$ to $\frac{1}{2}$ mile of these facilities and potential exists for further development in the future. There is little or no non-residential (industrial or commercial) development close to these plants.



- ✱ Treatment Plant
- Residential
- Non-residential
- Vacant

Figure V-1
ADJACENT LAND USES

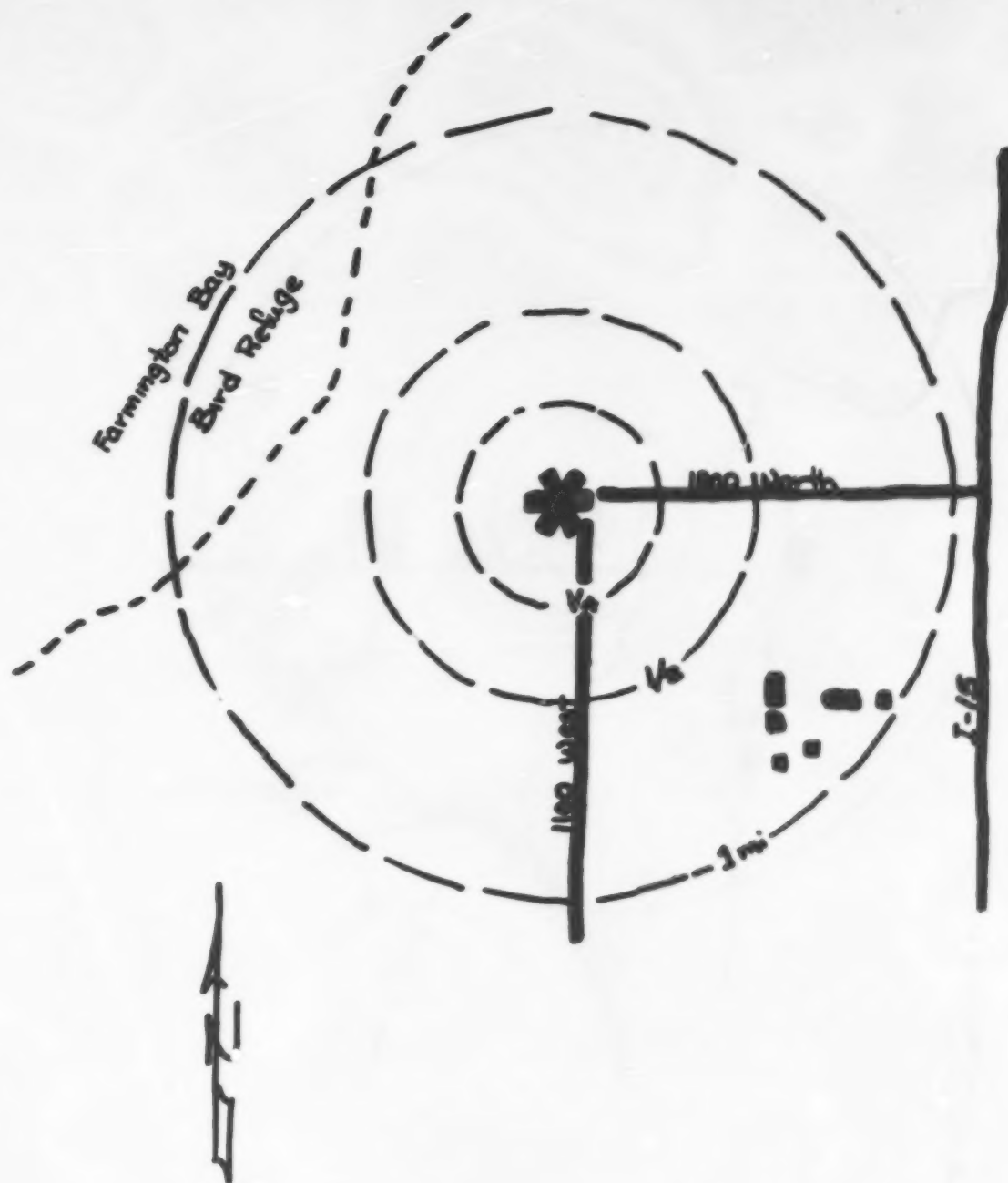
NORTH DAVIS



-  Treatment Plant
-  Residential
-  Non-residential
-  Vacant

Figure V-2
ADJACENT LAND USES

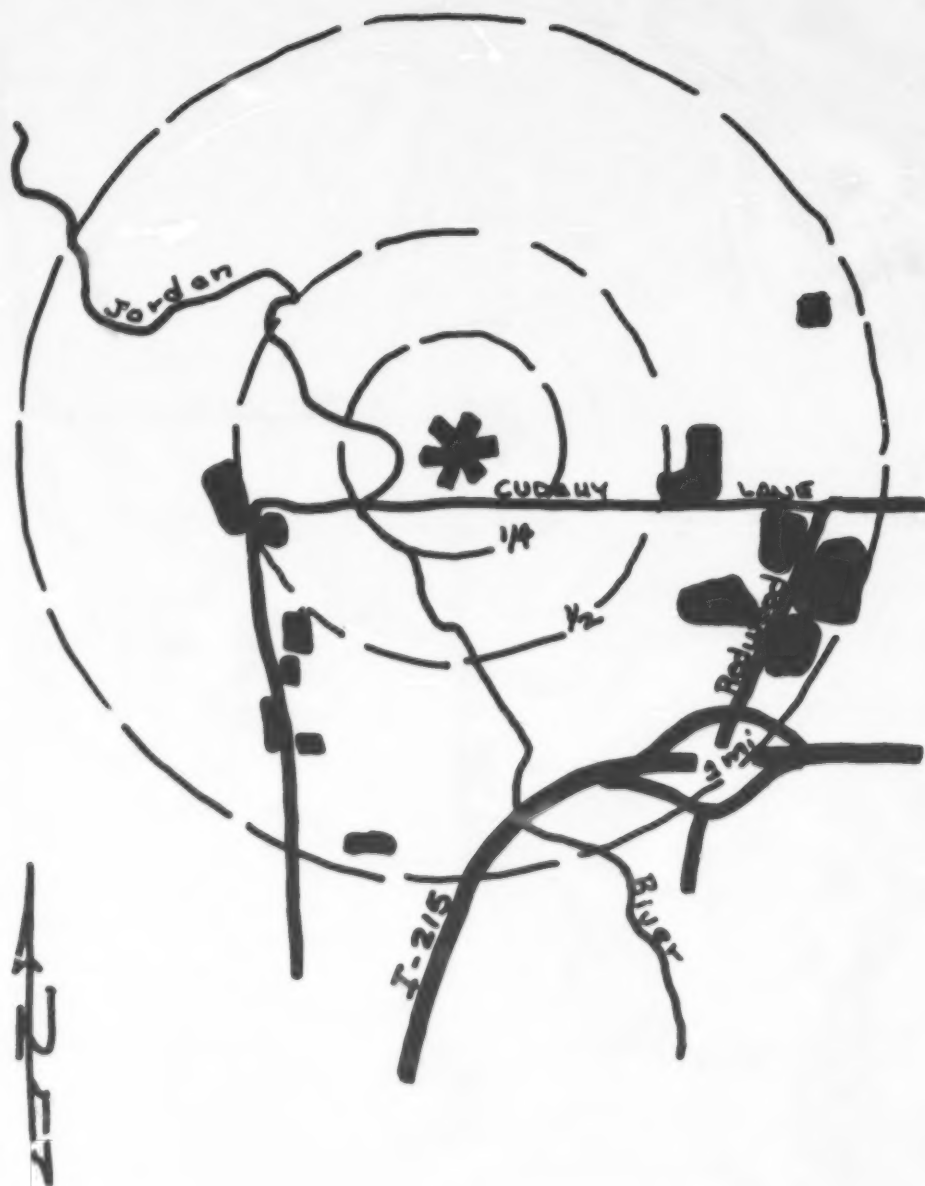
CENTRAL DAVIS



-  Treatment Plant
-  Residential
-  Non-residential
-  Vacant

Figure V-3
ADJACENT LAND USES

SOUTH DAVIS NORTH



-  Treatment Plant
-  Residential
-  Non-residential
-  Vacant

Figure V-4
ADJACENT LAND USES

SOUTH DAVIS SOUTH

TABLE V-2
ADJACENT LAND USE IMPACTS DAVIS COUNTY
MUNICIPAL WASTEWATER MANAGEMENT ALTERNATIVES

<u>Alternate</u>	<u>North Davis</u>	<u>Central Davis</u>	<u>South Davis North</u>	<u>South Davis South</u>
DC-1	S/M	S/M	M/N	M/N
DC-2	S/M	S/M	M/N	M/N
DC-3	S/M	S/M	M/N	M/N
DC-4	S/M	S/M	M/N	M/N
DC-5	S*/M	-	M/N	M/N
DC-6	S*/M	-	M/N	M/N
DC-7	S/M	S/M	M*/N	-
DC-8	S/M	S/M	M*/N	-
DC-9	S/M	S*/M	-	-
DC-10	S/M	S/M	M/N	-
DC-11	S/M	S/M	M/N	-
DC-12	S/M	S/M	-	-
DC-13	S/M	S/M	-	-
DC Recom- mended Plan	S/M	S/M	M*/N	-

Key:

S - Severe Adverse Impact
 S/M - Severe to Moderate Impact
 M/N - Moderate to Negligible Impact
 N - Negligible Impact
 * - Emphasis towards one End of Scale
 - - Abandoned Facility
 (see text for further discussion of criteria)

Adverse adjacent land use impacts at South Davis North and South Davis South are judged moderate to negligible. There is no development within $\frac{1}{2}$ mile of either facility and little development between $\frac{1}{2}$ mile and one mile. The South Davis South facility has some non-residential development within $\frac{1}{2}$ mile to one mile of the plant. If this land could be managed to promote only non-residential land use in the future, this could act as a buffer, hence become a beneficial impact.

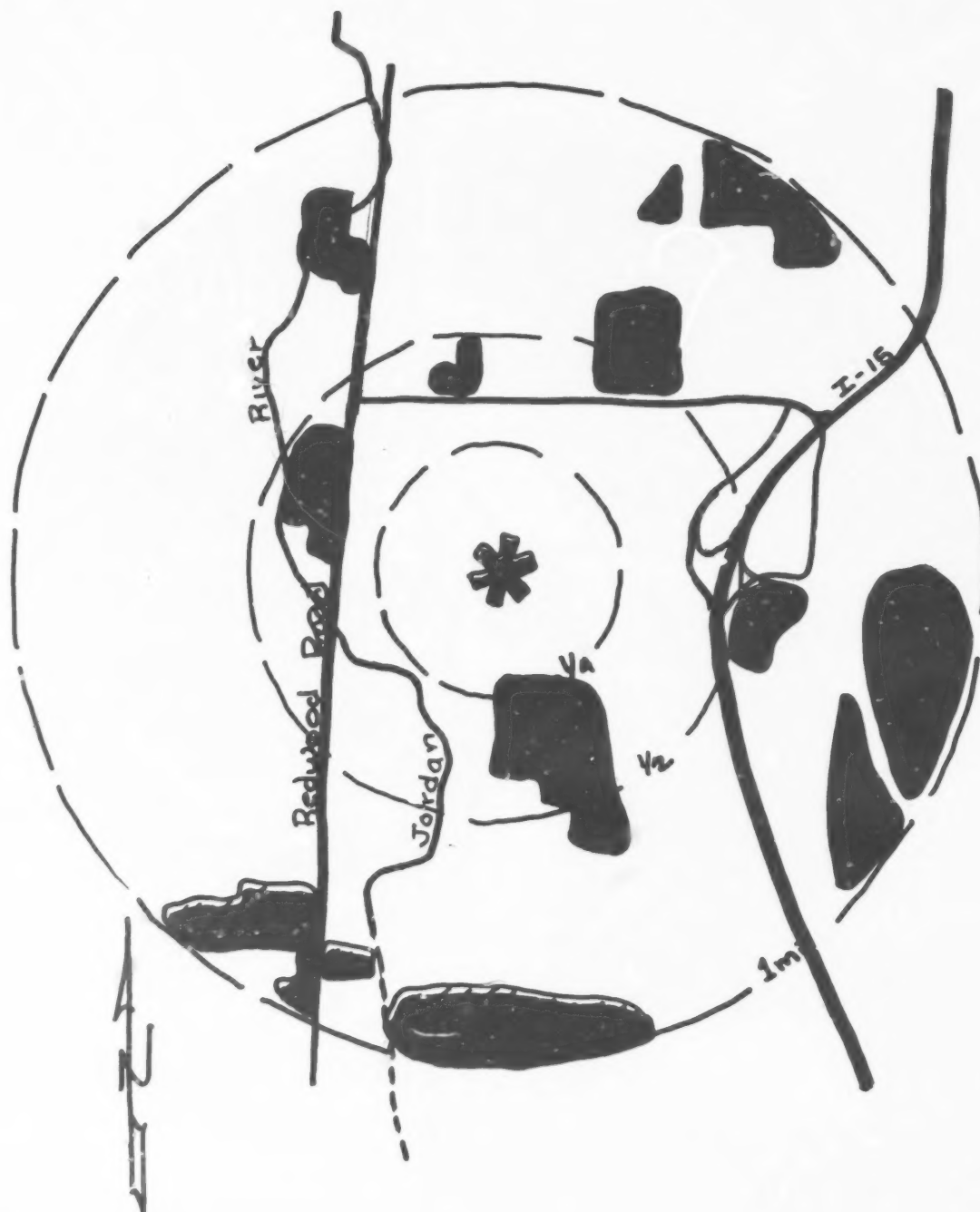
Salt Lake County

Adjacent land uses for Salt Lake County wastewater treatment facilities are illustrated in Figures V-5 to V-12. The Salt Lake City, South Salt Lake, and Salt Lake Suburban Sanitation District No. 1 plants have little or no residential development within $\frac{1}{2}$ mile of the facility site. Industrial and other non-residential land uses occupy large sections of the adjacent land, thus expansion and upgrading of these facilities will probably create moderate to negligible adverse impacts on adjacent land uses. Residential land use has encroached within $\frac{1}{2}$ mile of the Cottonwood, Tri-Community, and Sandy facilities. Scattered non-residential land uses exist within $\frac{1}{2}$ mile of the Sandy and Cottonwood facilities. Potential adverse impacts on adjacent land uses of these three facilities are judged severe to moderate. Adverse impacts on land uses adjacent to the Granger-Hunter and Murray wastewater treatment plants are severe because of significant residential development within $\frac{1}{2}$ mile of these facilities.

Adjacent land use impacts for alternative wastewater management strategies in Salt Lake County are presented in Table V-3. From an adjacent land use impact basis, treatment alternatives SLC-7, SLC-8, and SLC-11 manifest the fewest adverse impacts. These three alternatives include the abandonment of all facilities except the Salt Lake City plant. This plant is further isolated from residential development than any of the others. The nearest residential development is about $\frac{3}{4}$ mile from the plant site. A tank farm is nearby but makes a good neighbor. There is adequate land available in the area for expansion, or to be left vacant as a space buffer between the treatment plant and other possible urban uses.

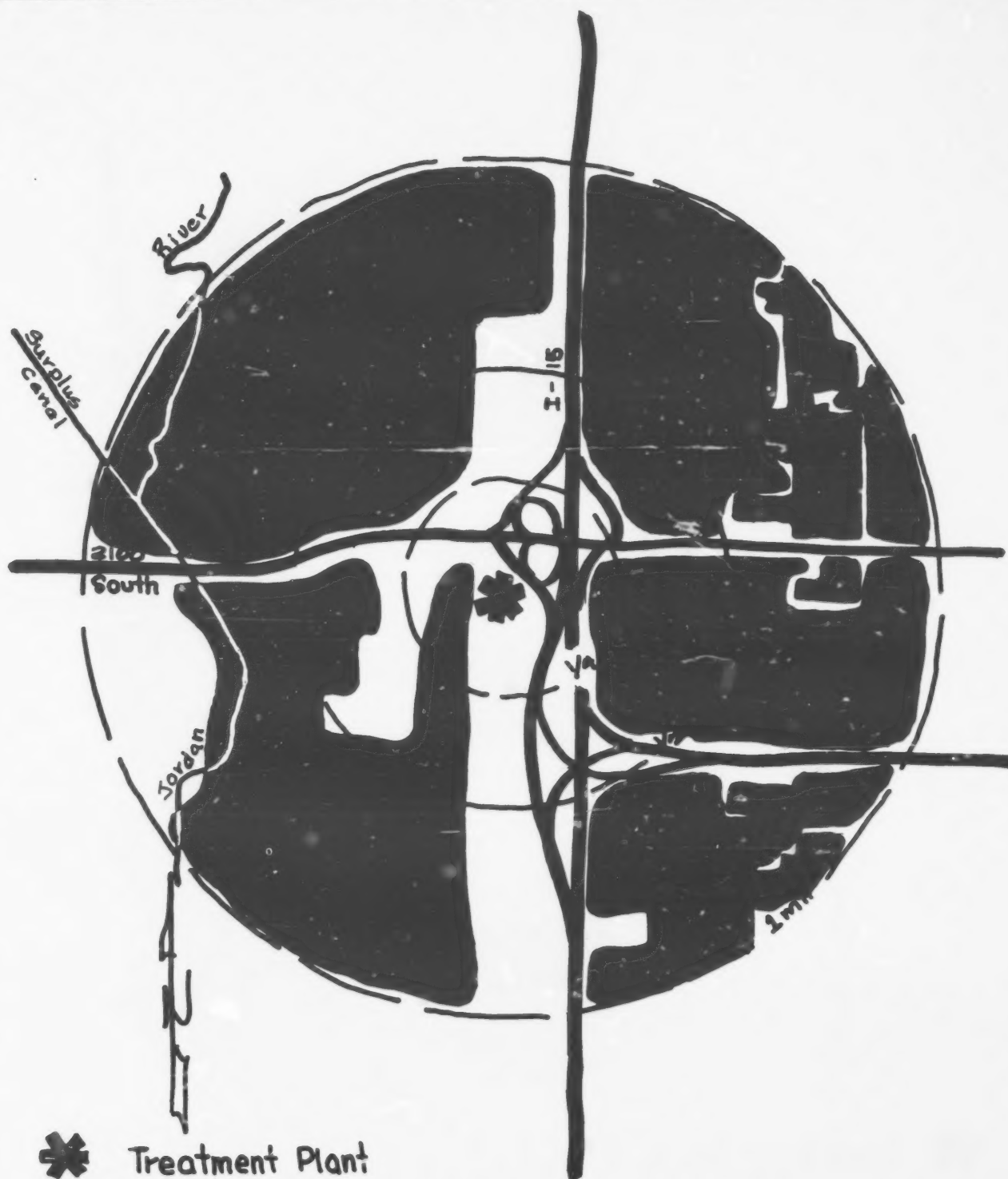
Alternates SLC-6, SLC-10, and SLC-12 represent another group which would have fewer problems than most alternates in Salt Lake County. However, this group relies on continued use and expansion of the Salt Lake Suburban No. 1 facility which unfortunately has some residential development about $\frac{1}{2}$ mile from the plant site. In addition, substantial industrial park development exists within one mile of the plant site. The condition is not severe, but could create problems if the plant is expanded.

The uranium tailings located at the Suburban Sanitation District No. 1 treatment facility have a potential adverse impact because of the potential for conveyance of harmful radioactive particles and radioactive pollution of surrounding surface and groundwater. Uncontaminated land exists for some expansion of the facility, but if the facility becomes a major regional treatment plant, as is the case in the alternatives above, additional land may have to be purchased or the uranium tailings moved. The Energy Research and Development Administration is presently funding a study to determine the impacts associated with the tailings and, if need be, the best method of removing and disposing of them.



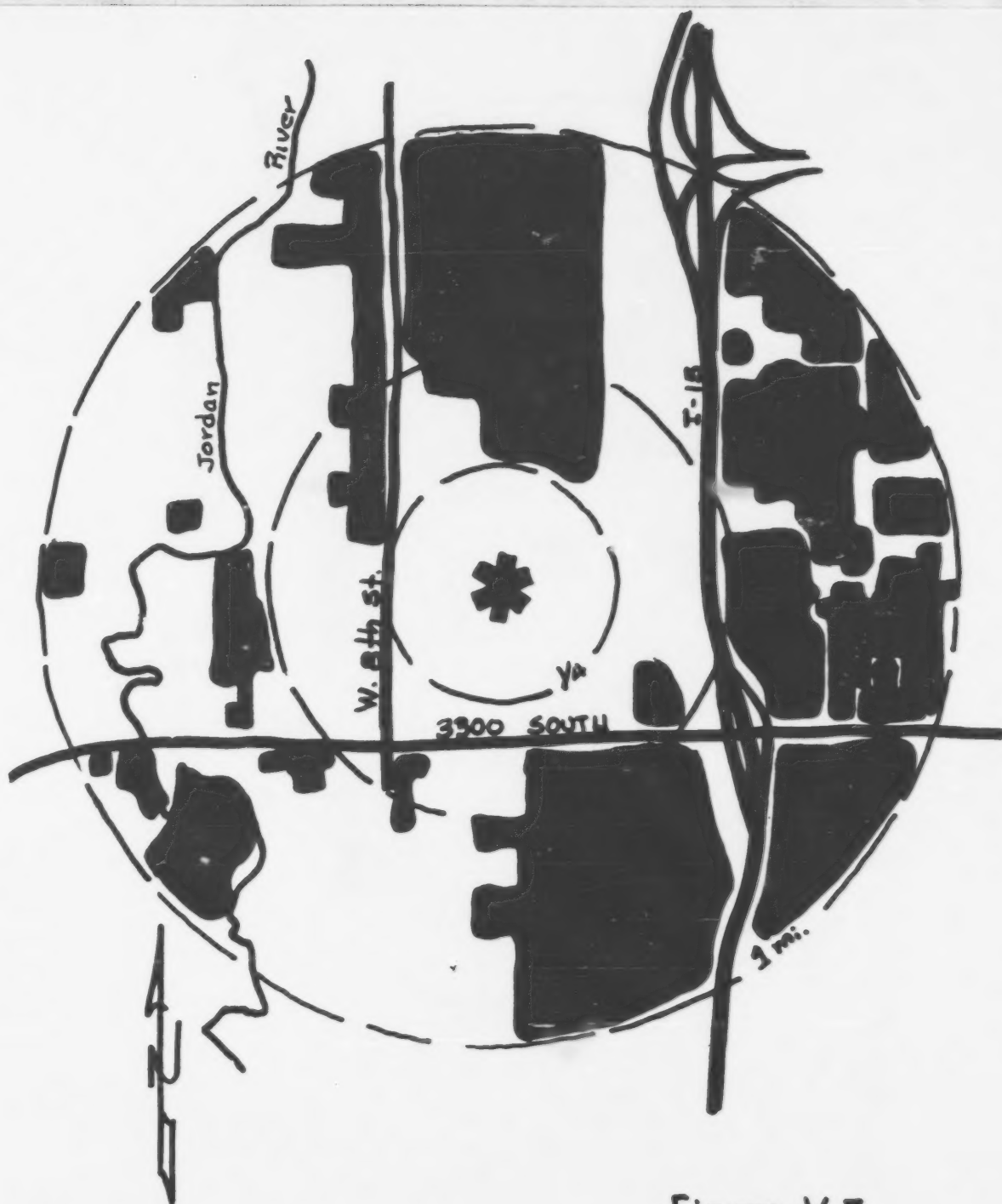
- ✱ Treatment Plant
- Residential
- Non-residential
- Vacant

Figure V-5
 ADJACENT LAND USES
SALT LAKE CITY



-  Treatment Plant
-  Residential
-  Non-residential
-  Vacant

Figure V-6
 ADJACENT LAND USES
SOUTH SALT LAKE

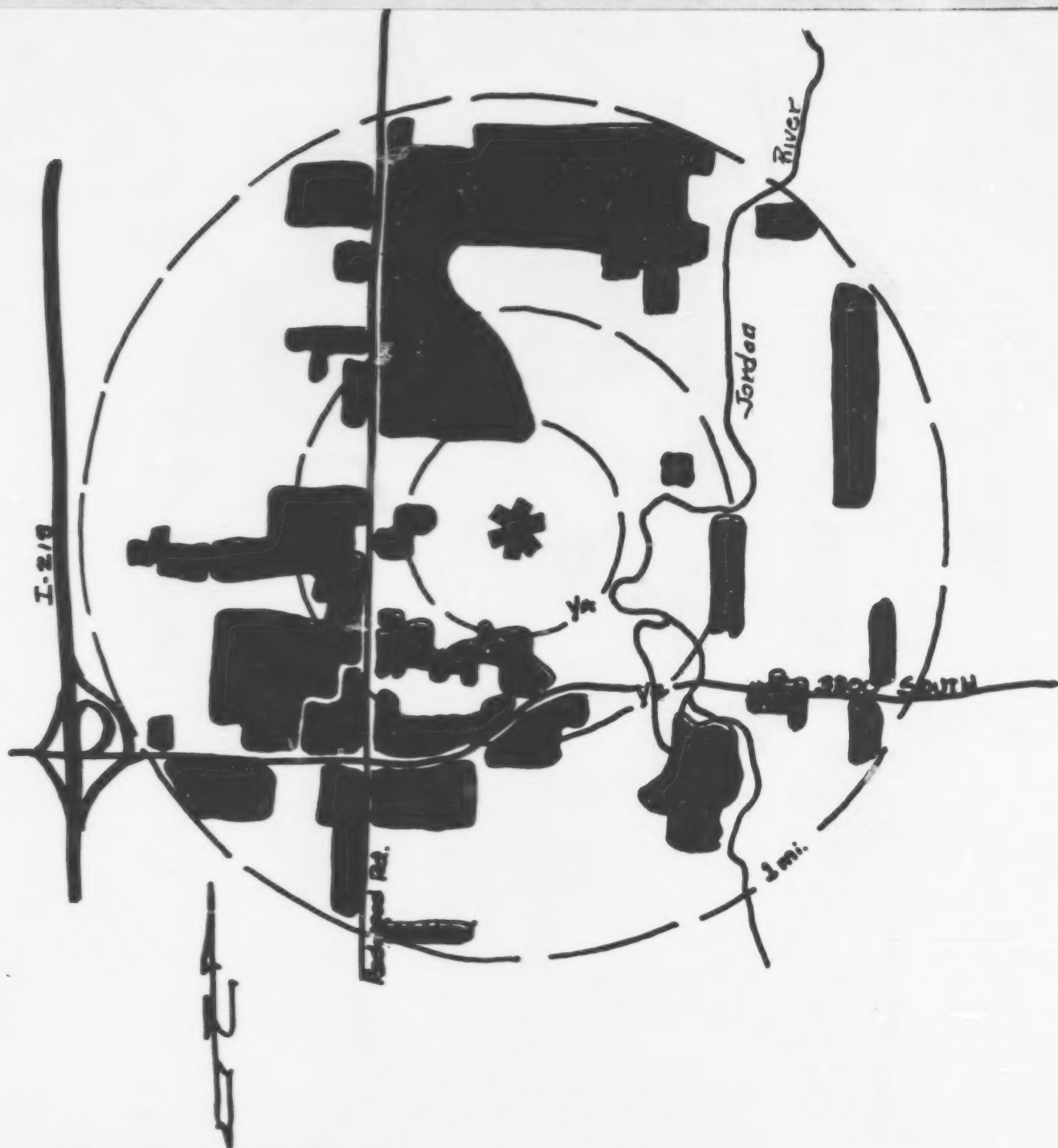


- * Treatment Plant
- Residential
- Non-residential
- Vacant

Figure V-7
ADJACENT LAND USES

SALT LAKE CITY

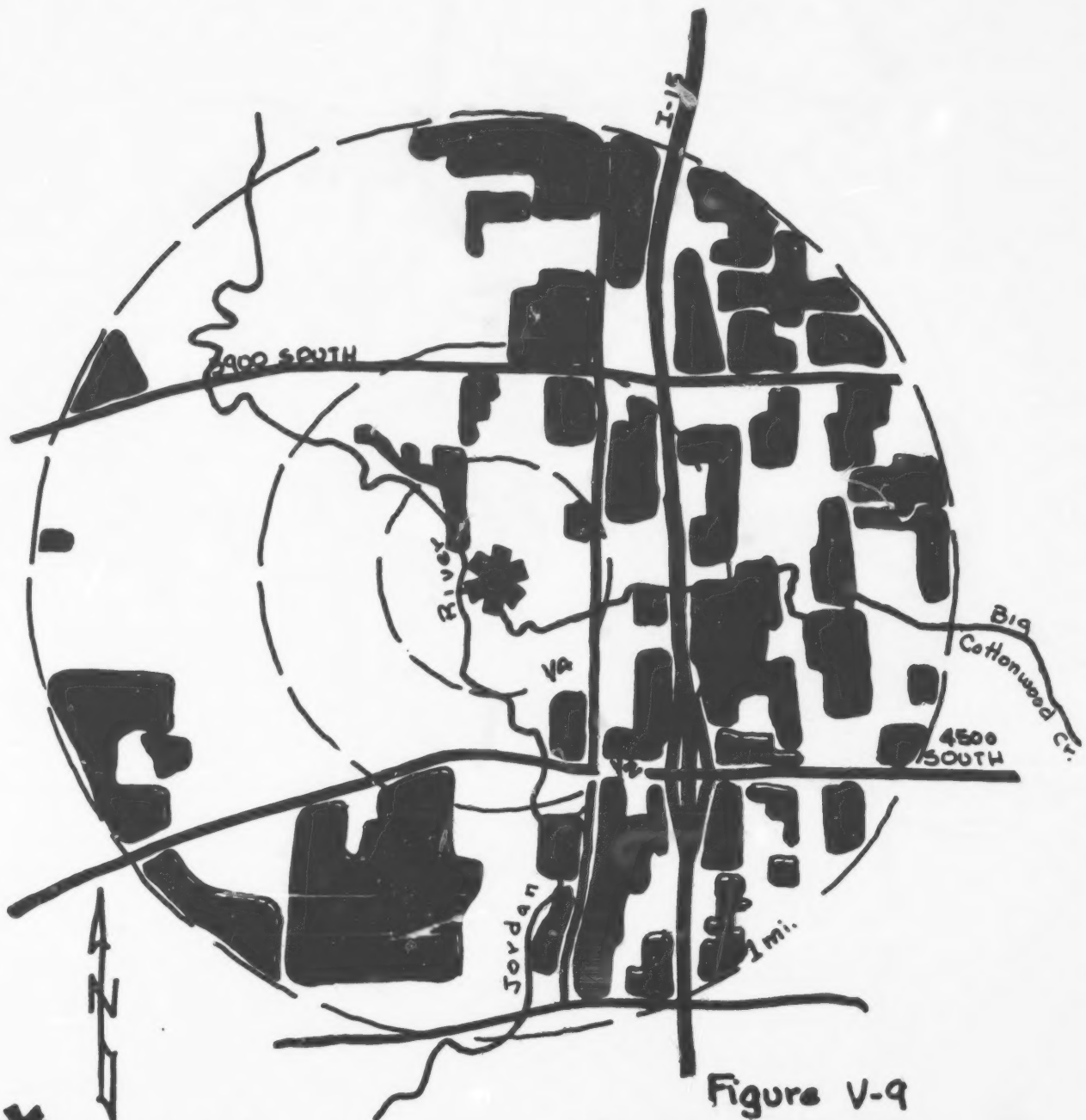
SUBURBAN #1



- ✱ Treatment Plant
- Residential
- Non-residential
- Vacant

Figure V-8
ADJACENT LAND USES

GRANGER-HUNTER



Treatment
Residential
Non-residential
Vacant

Figure V-9
ADJACENT LAND USES

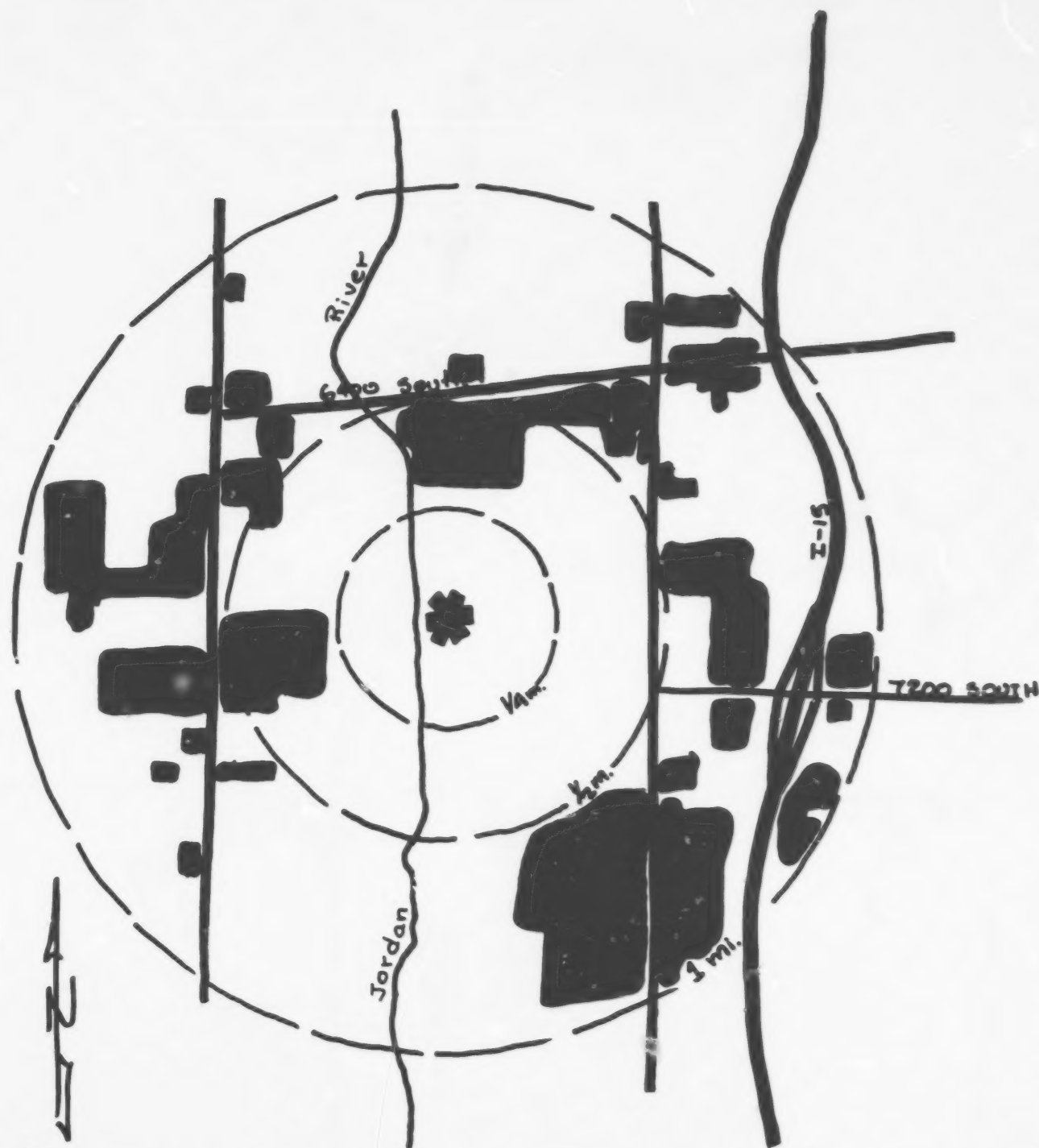
SALT LAKE COUNTY COTTONWOOD



- * Treatment Plant
- Residential
- Non-residential
- Vacant

Figure V-10
ADJACENT LAND USES

MURRAY



- ✱ Treatment Plant
- Residential
- Non-residential
- Vacant

Figure V-11

ADJACENT LAND USES

TRI-COMMUNITY

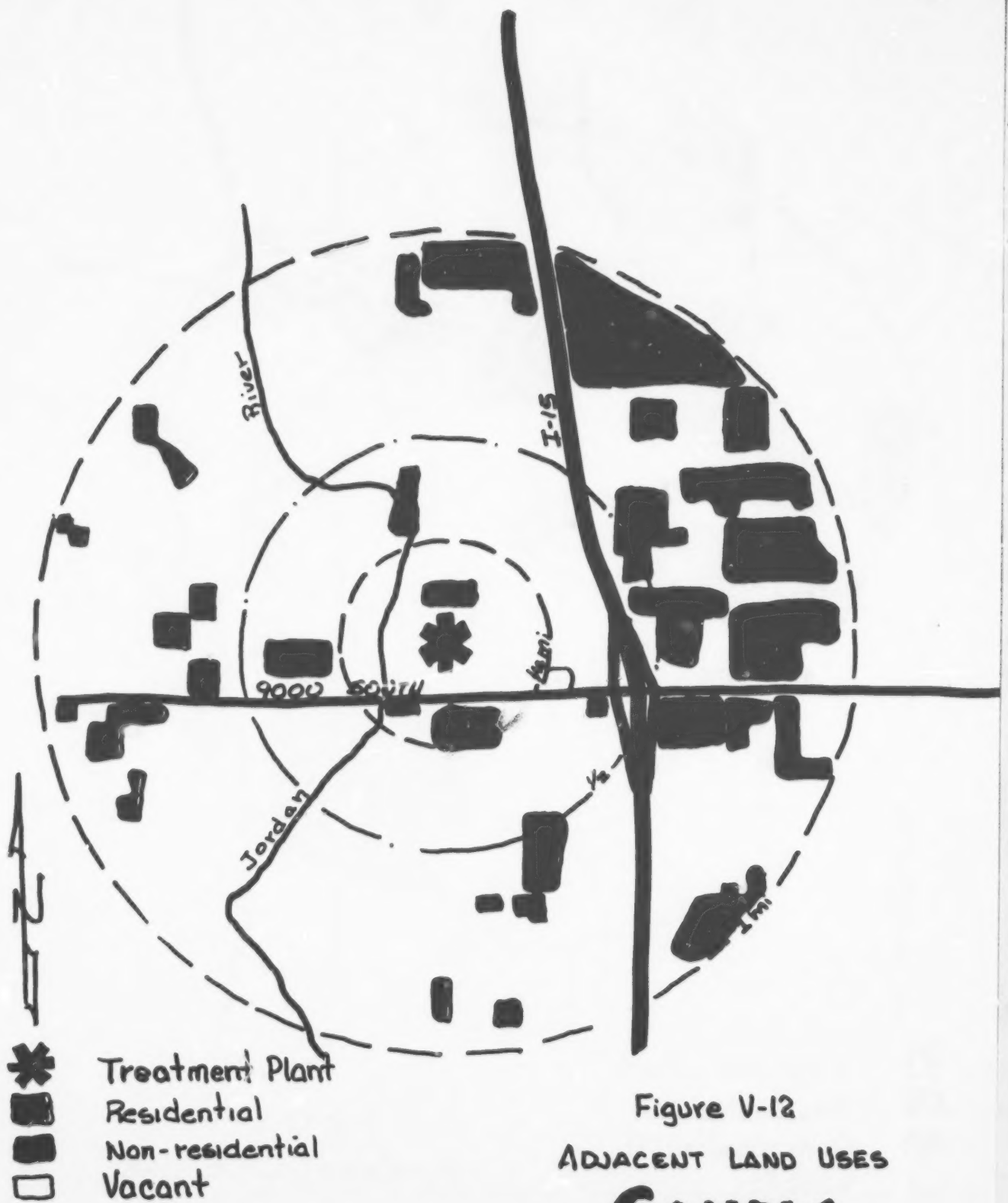


Figure V-12
ADJACENT LAND USES

SANDY

TABLE V-3

ADJACENT LAND USE IMPACTS SALT LAKE COUNTY
MUNICIPAL WASTEWATER MANAGEMENT ALTERNATIVES

<u>Alternate</u>	<u>Salt Lake City</u>	<u>South Salt Lake</u>	<u>Granger- Hunter</u>	<u>Salt Lake Sub. #1</u>	<u>Salt Lake County - Cottonwood</u>	<u>Murray</u>	<u>Tri- Community</u>	<u>Sandy</u>
SLC-1	M/N	M/N	S	M/N	S/M	S	S/M	S/M
SLC-2	M/N	M/N	S	M/N	S/M	S	S/M	S/M
SLC-3	M/N	-	-	M*/N	S*/M	-	S*/M	-
SLC-4	M/N	-	-	M*/N	S*/M	-	S*/M	-
SLC-5	M/N	-	-	M*/N	-	-	S*/M	-
SLC-6	M/N	-	-	M*/N	-	-	-	-
SLC-7	M*/N	-	-	-	-	-	-	-
SLC-8	M*/N	-	-	-	-	-	-	-
SLC-9	M/N	-	-	M*/N	-	-	S*/M	-
SLC-10 ¹	M/N	-	-	M*/N	-	-	-	-
SLC-11	M*/N	-	-	-	-	-	-	-
SLC-12	M*/N	-	-	M*/N	-	-	-	-

¹Recommended plan.

Key:

S - Severe Adverse Impact
 S/M - Severe to Moderate Impact
 M/N - Moderate to Negligible Impact
 N - Negligible Impact
 * - Emphasis towards one End of Scale
 - - Abandoned Facility
 (see text for further discussion of criteria)

Northern Utah County

Land uses adjacent to existing wastewater treatment plants in Northern Utah County are illustrated in Figures V-13 to V-16. The American Fork facility has the most developed land in proximity to the treatment plant. Some residential development exists within $\frac{1}{2}$ mile and some non-residential uses are within $\frac{1}{4}$ mile. Thus, adjacent land use impacts are rated severe to moderate. The remaining three facilities, Lehi, Pleasant Grove, and Orem, all have little or no development within $\frac{1}{2}$ mile and are rated moderate to negligible.

Adjacent land use impacts for Northern Utah County facilities are presented in Table V-4. Alternatives NUC-8 and NUC-9 result in the least overall adverse adjacent land use impacts because they would limit land use impacts to the Orem site. Potential adverse impacts at new regional facilities such as those in NUC-5, NUC-6, NUC-7, NUC-10, NUC-11, and NUC-12 should be determined if and when the site is selected.

Central Utah County

Five sewage treatment plant sites are considered in Central Utah County. Land uses adjacent to these five facilities are illustrated in Figures V-17 to V-21. Of the five, only the Springville site manifests severe to moderate adverse adjacent land use impacts due to significant residential development within $\frac{1}{2}$ mile of the facility. Payson has some residential development within one mile of the plant site, but like Provo, Spanish Fork, and Salem, most of the development within $\frac{1}{2}$ mile is non-residential. Thus, these three facilities are rated moderate to negligible.

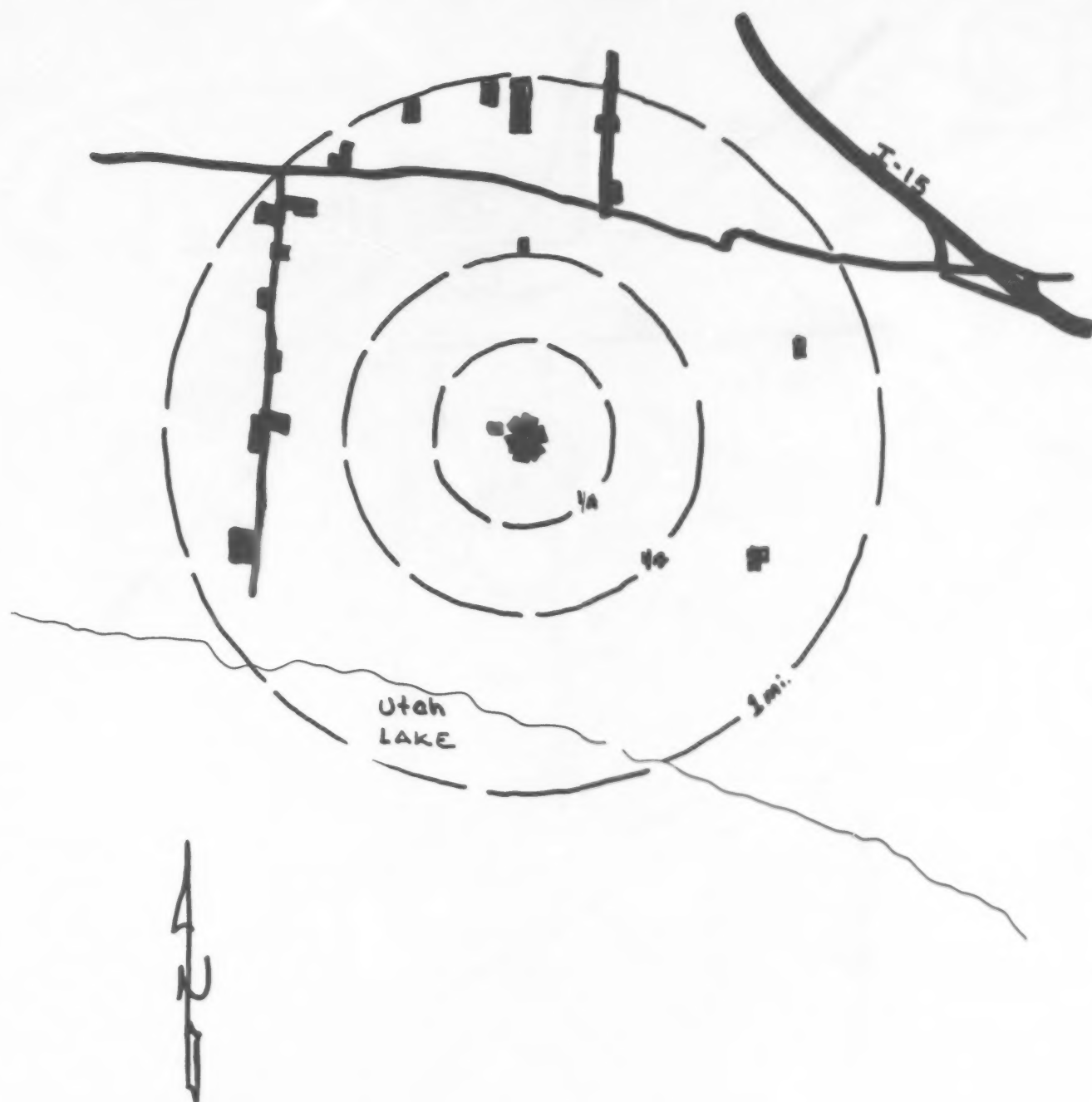
As presented in Table V-5, all Central Utah County alternatives manifest some moderate level impacts on adjacent land uses. Alternates CUC-10, CUC-11, and CUC-12 appear to have the least impacts on adjacent land use. For these alternatives, the Provo plant becomes the regional plant for the service area and residential uses are limited within $\frac{1}{2}$ mile of this treatment site.

Wasatch County

As illustrated in Figure V-22, the Heber wastewater treatment facility has significant residential development within the $\frac{1}{2}$ mile radius, thus adjacent land use impacts are judged severe to moderate. There is also some residential development within $\frac{1}{2}$ mile of the Midway facility, Figure V-23, but not at the level manifested in Heber. For this reason, adjacent land use impacts at Midway are deemed moderate to negligible.

Adjacent land use impacts for Wasatch County wastewater treatment alternatives are presented in Table V-6. If significant growth occurs in the Wasatch County, Heber City-Midway area, Alternates WC-3, WC-4, WC-5, or WC-6 may solve the potential problems resulting from adjacent residential land uses. The regional site should be located one or more miles from any residential use.

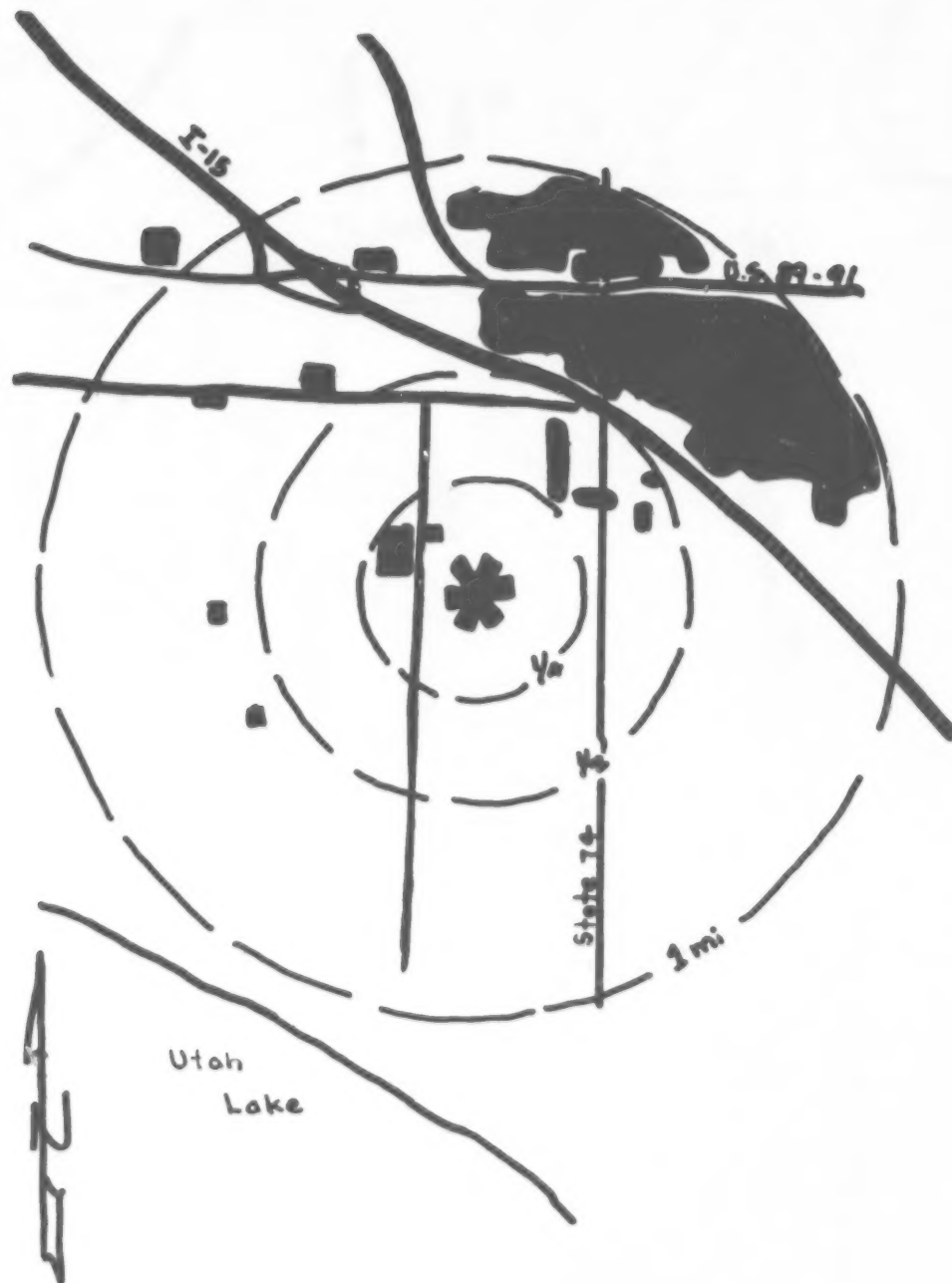
The existing Heber City plant is too near existing and potential development. Any expansion of this facility or expansion of housing on that side of the community would likely generate problems, detracting from the liveability of the community near the site. It must be kept in mind, however, that regionalization via WC-6 (Provo Canyon sewer) would mitigate land use impacts adjacent to the Heber and Midway facilities at the expense of land use development in Provo Canyon.



- ✱ Treatment Plant
- Residential
- Non-residential
- Vacant

Figure V-13
ADJACENT LAND USES

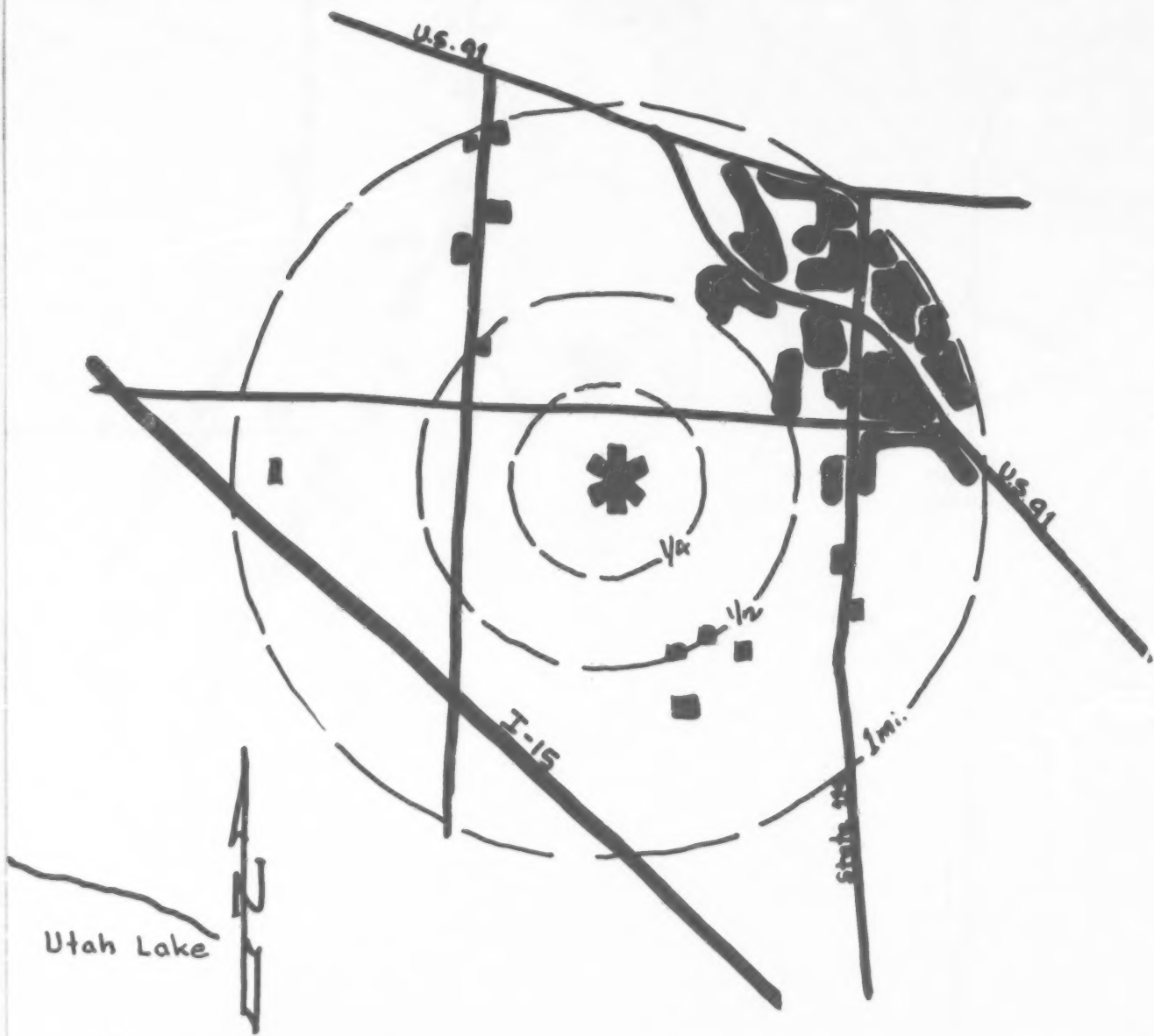
LEHI



- ✱ Treatment Plant
- Residential
- Non-residential
- Vacant

Figure V-14
ADJACENT LAND USES

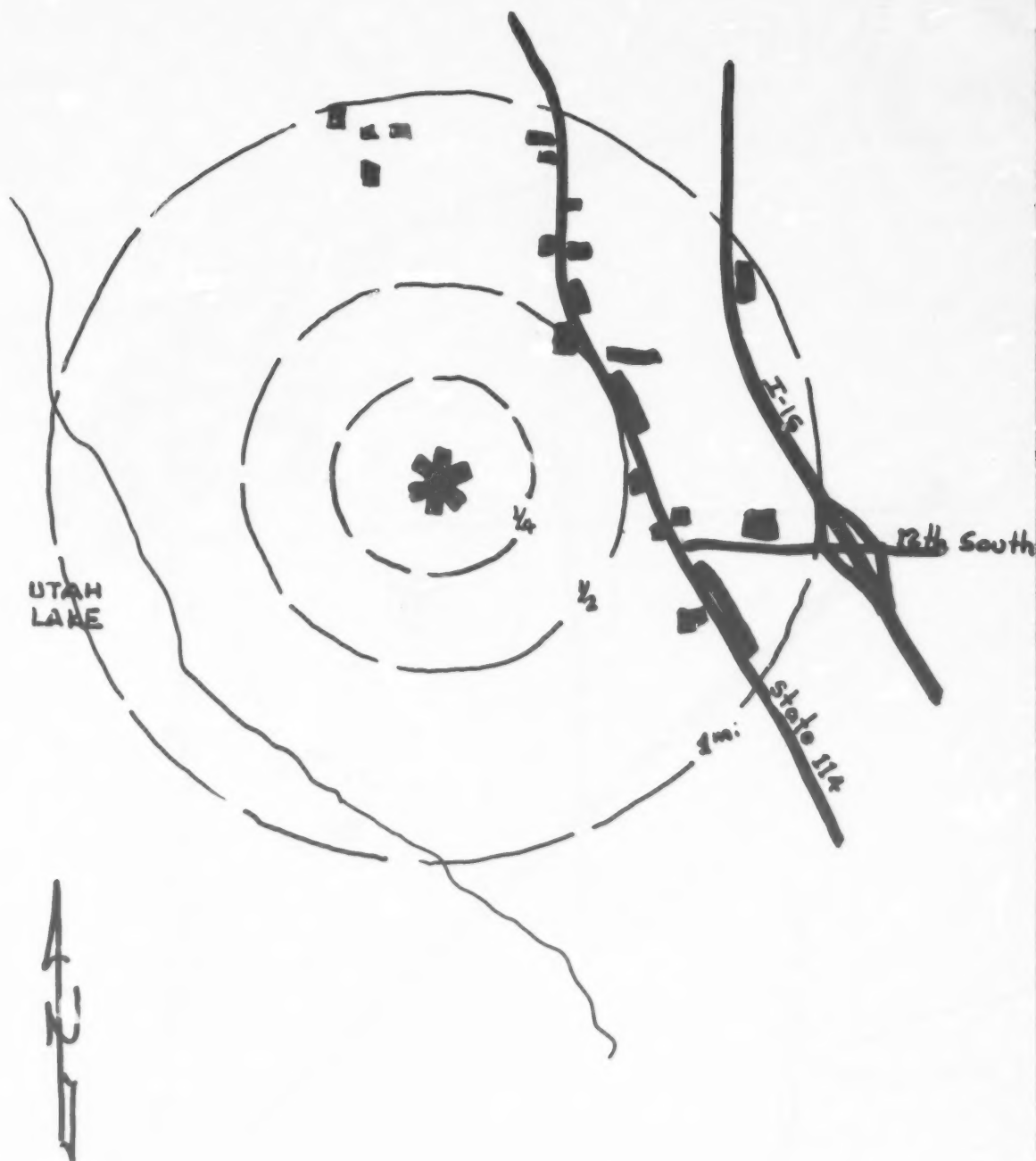
AMERICAN FORK



-  Treatment Plant
-  Residential
-  Non-residential
-  Vacant

Figure V-15
ADJACENT LAND USES

PLEASANT GROVE



-  Treatment Plant
-  Residential
-  Non-residential
-  Vacant

Figure V-16
ADJACENT LAND USES

OREM

TABLE V-4

ADJACENT LAND USE IMPACT NORTH UTAH COUNTY
MUNICIPAL WASTEWATER MANAGEMENT ALTERNATIVES

<u>Alternate</u>	<u>Lehi</u>	<u>American Fork</u>	<u>Pleasant Grove</u>	<u>Orem</u>
NUC-1	M/N	S/M	M/N	M/N
NUC-2	M/N	S/M	M/N	M/N
NUC-3	M/N	S/M	M/N	M/N
NUC-4	M/N	S/M	M/N	M/N
NUC-5	-	S*/M	-	M/N
NUC-6	-	S*/M	-	M/N
NUC-7	-	N	-	M/N
NUC-8	-	-	-	M*/N
NUC-9	-	-	-	M*/N
NUC Recommended Plan	-	S*/M	-	M/N

Key:

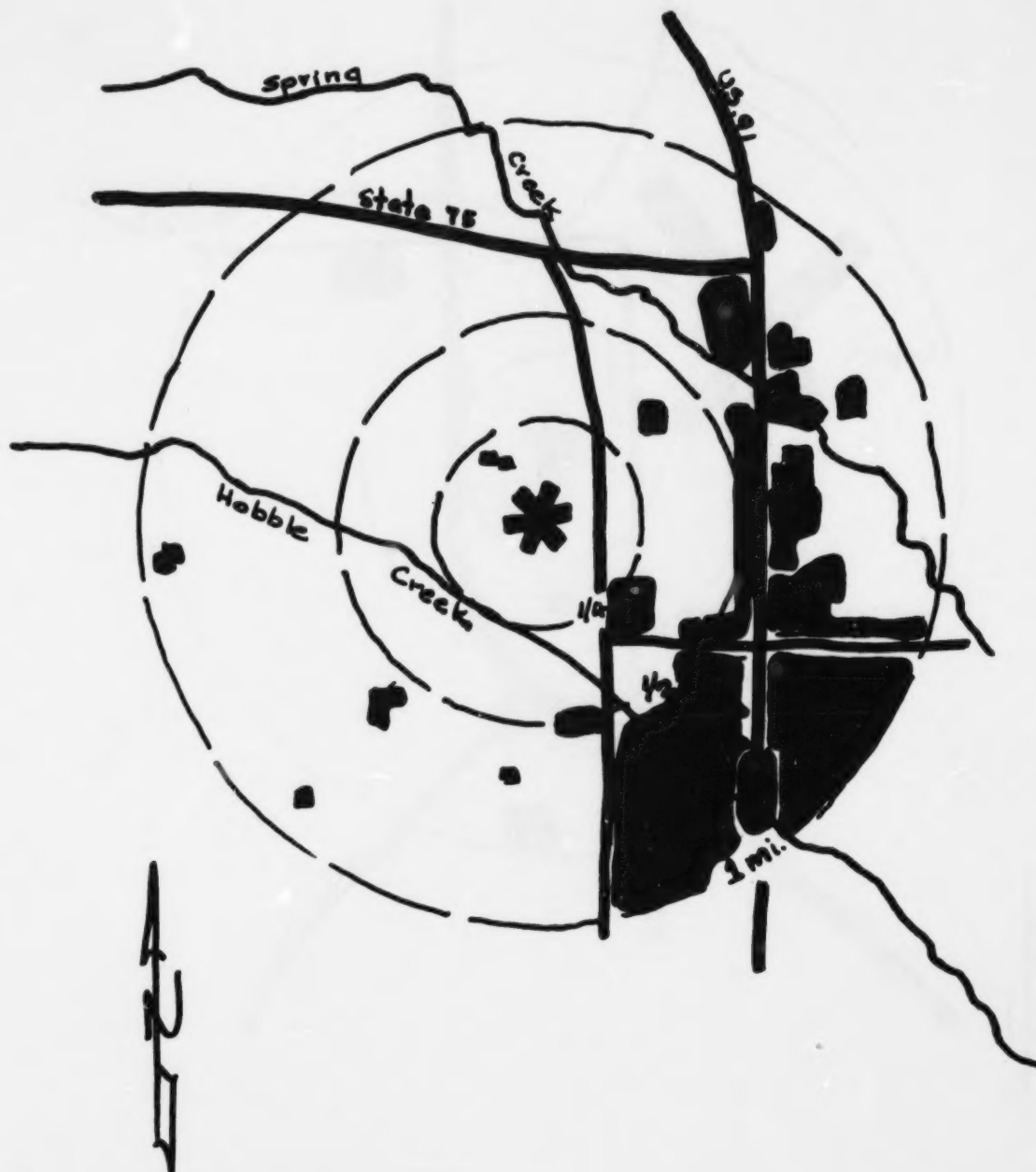
- S - Severe Adverse Impact
 - S/M - Severe to Moderate Impact
 - M/N - Moderate to Negligible Impact
 - N - Negligible Impact
 - * - Emphasis towards one End of Scale
 - - Abandoned Facility
- (see text for further discussion of criteria)



- * Treatment Plant
- Residential
- Non-residential
- Vacant

Figure V-17
ADJACENT LAND USES

PROVO



-  Treatment Plant
-  Residential
-  Non-residential
-  Vacant

Figure V-18
ADJACENT LAND USES

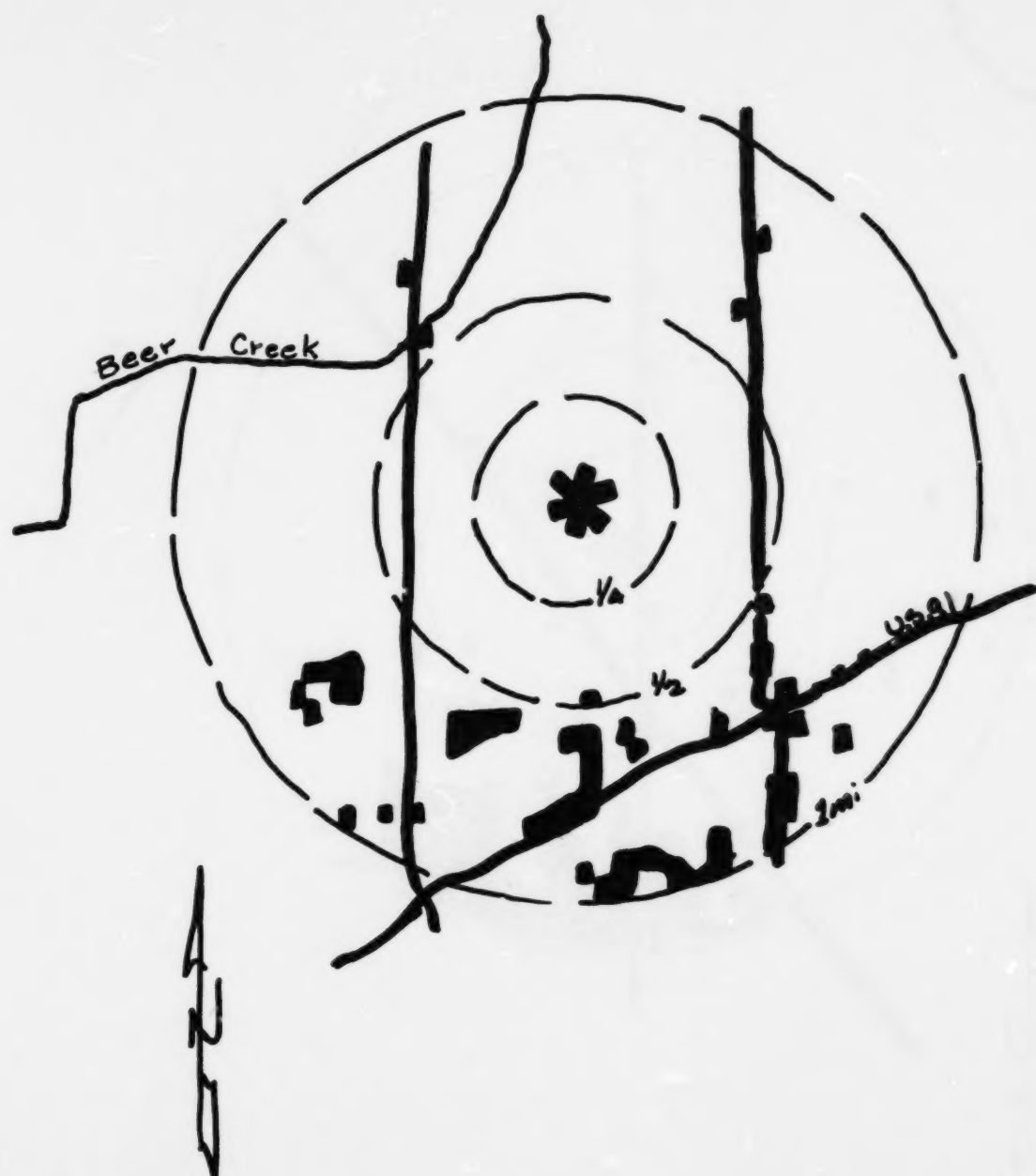
SPRINGVILLE



- ★ Treatment Plant
- Residential
- Non-residential
- Vacant

Figure V-19
ADJACENT LAND USES

SPANISH FORK



-  Treatment Plant
-  Residential
-  Non-residential
-  Vacant

Figure V-20
ADJACENT LAND USES

SALEM

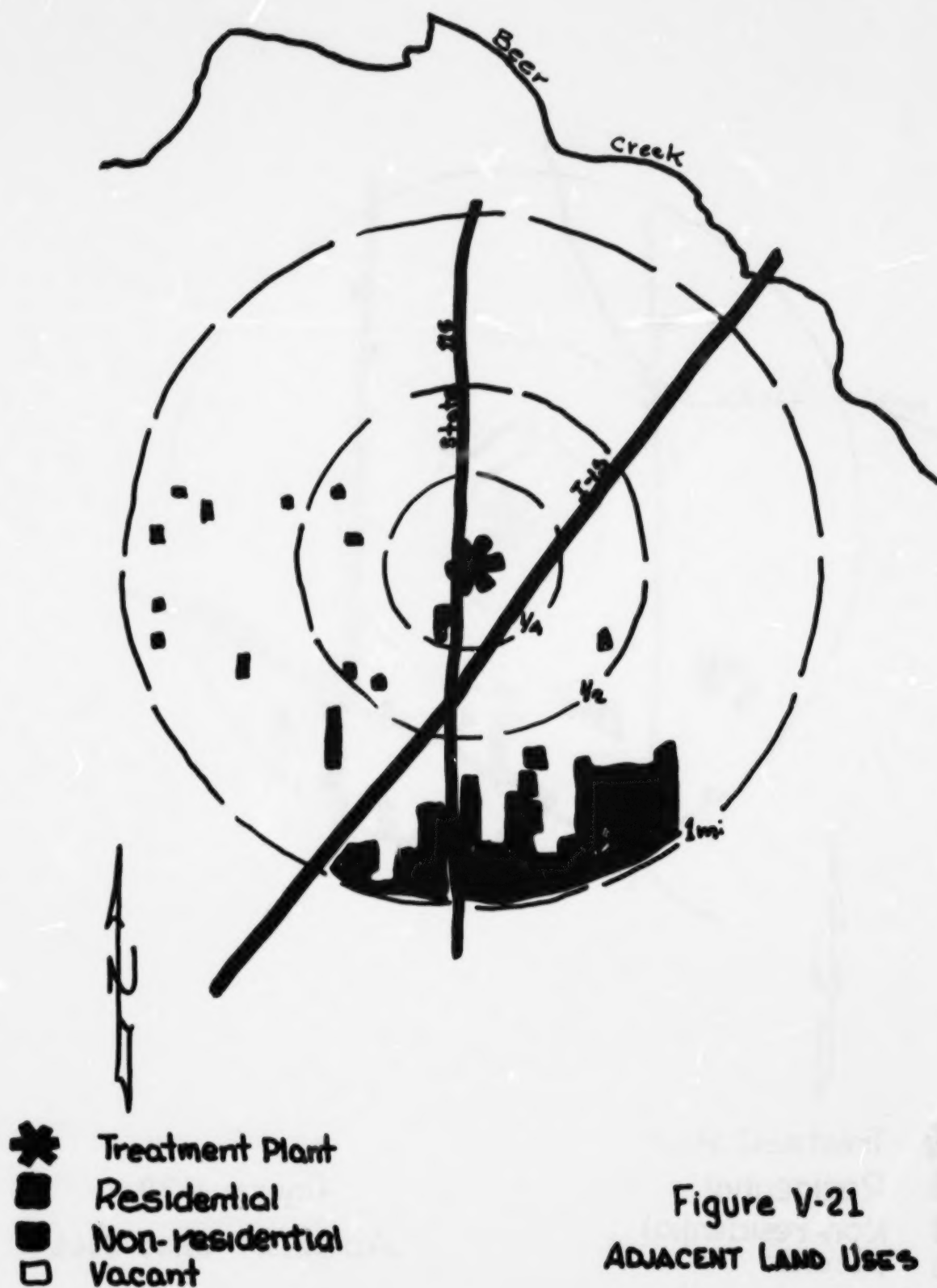


Figure V-21
ADJACENT LAND USES

PAYSON

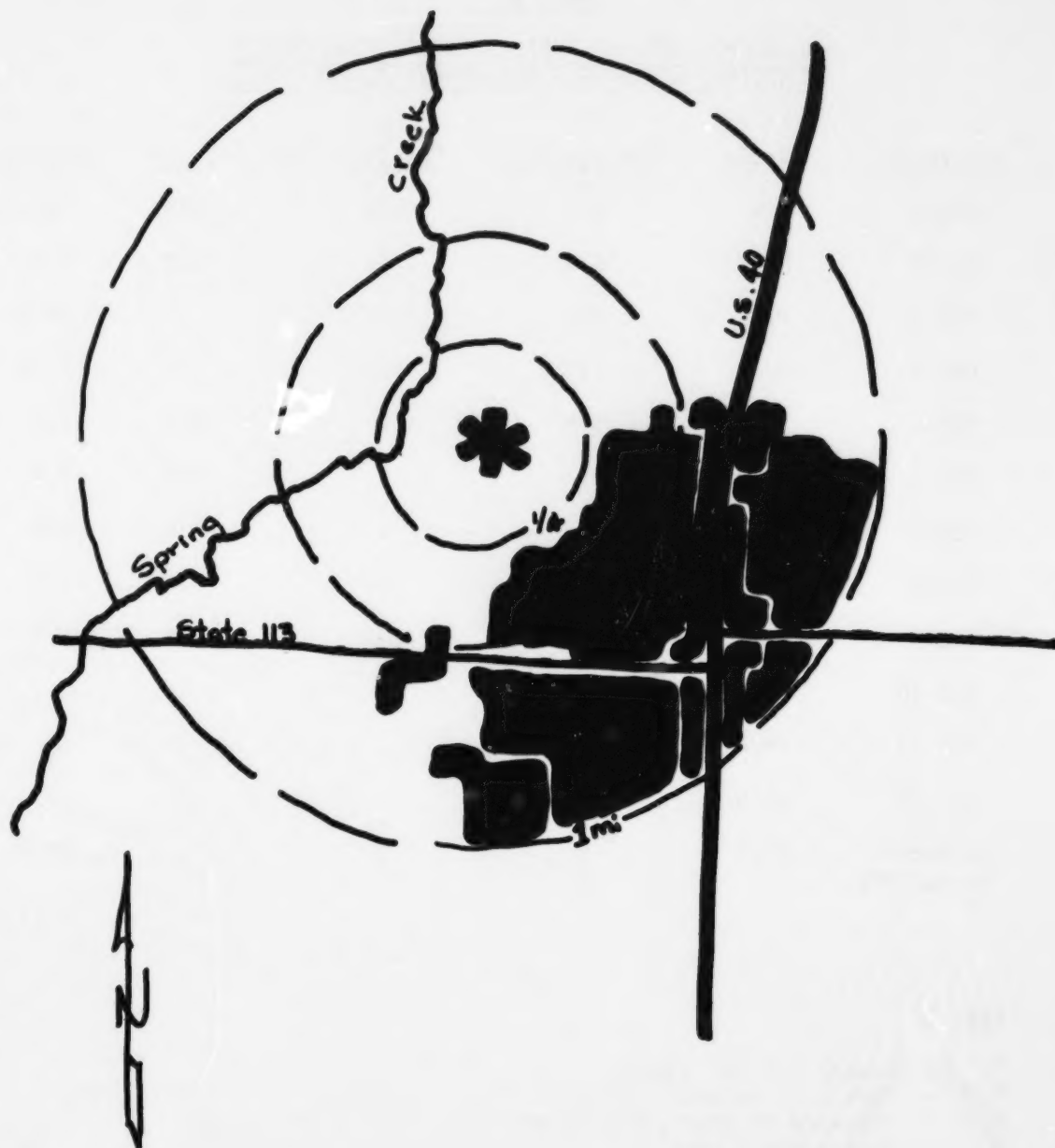
TABLE V-5

ADJACENT LAND USE IMPACT CENTRAL UTAH COUNTY
MUNICIPAL WASTEWATER MANAGEMENT ALTERNATIVES

<u>Alternate</u>	<u>Provo</u>	<u>Springville</u>	<u>Spanish Fork</u>	<u>Salem</u>	<u>Payson</u>
CUC-1	M/N	S/M	M/N	M/N	M/N
CUC-2	M/N	S/M	M/N	M/N	M/N
CUC-3	M/N	S/M	M/N	-	M*/N
CUC-4	M/N	S/M	M/N	-	M*/N
CUC-5	M*/N	S/M	-	M/N	M/N
CUC-6	M*/N	-	-	M/N	M/N
CUC-7	M*/N	-	-	M/N	M/N
CUC-8	M*/N	-	M/N	M/N	M/N
CUC-9	M*/N	-	M/N	M/N	M/N
CUC-10	M*/N	-	-	-	-
CUC-11	M*/N	-	-	-	-
CUC-12	M*/N	-	-	-	-
CUC Recom- mended Plan	M*/N	-	-	-	M*/N

Key:

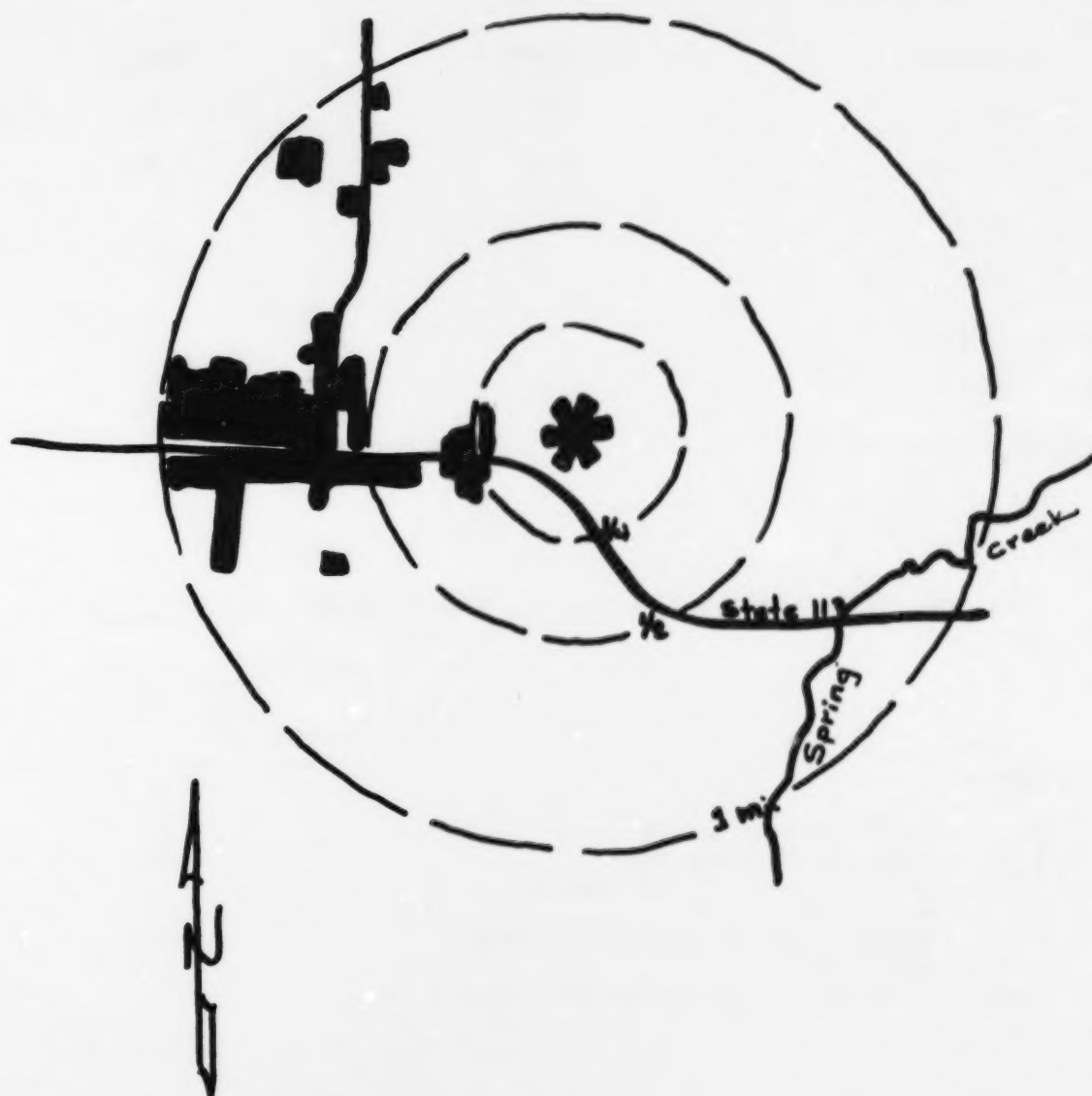
- S - Severe Adverse Impact
 - S/M - Severe to Moderate Impact
 - M/N - Moderate to Negligible Impact
 - N - Negligible Impact
 - * - Emphasis towards one End of Scale
 - - Abandoned Facility
- (see text for further discussion of criteria)



-  Treatment Plant
-  Residential
-  Non-residential
-  Vacant

Figure V-22
ADJACENT LAND USES

HEBER CITY



- ✱ Treatment Plant
- Residential
- Non-residential
- Vacant

Figure V-23
ADJACENT LAND USES

MIDWAY

TABLE V-6

ADJACENT LAND USE IMPACT WASATCH COUNTY
MUNICIPAL WASTEWATER MANAGEMENT ALTERNATIVES

<u>Alternate</u>	<u>Midway</u>	<u>Heber</u>
WC-1	M/N	S/M
WC-2	M/N	S/M
WC-3 ¹	-	-
WC-4 ¹	-	-
WC-5 ¹	-	-
WC-6	-	-
WC Recommended Plan ¹	-	-

¹New plant located at Charleston to serve both Midway and Heber areas.

Key:

- S - Severe Adverse Impact
 - S/M - Severe to Moderate Impact
 - M/N - Moderate to Negligible Impact
 - N - Negligible Impact
 - * - Emphasis towards one End of Scale
 - - Abandoned Facility
- (see text for further discussion of criteria)

Flood Hazards

Flooding of treatment plants can create potential pollution from bypassing of raw or improperly treated sewage. Other adverse impacts include damage to equipment, plant shutdowns, and the additional cost of flood protection and flood-proofing.

Based on Corps of Engineers and Salt Lake County flood plain studies, the Murray and Tri-Community wastewater treatment facilities could be inundated by the Standard 100 year and/or the 250 year flood. Currently, a slag dike affords some protection for the Tri-Community facility, but this structure is not sufficient to prevent flooding caused by the 100 year or 250 year floods. The Tri-Community facility is recommended as a regional wastewater treatment plant in Alternatives SLC-3, SLC-4, SLC-5, and SLC-9, and the potential impacts of a flood would be magnified if any of these alternatives were implemented.

The Murray facility will be affected by the 100 year flood only if debris at the 4500 Street South bridge causes an obstruction to flood flow. However, the 250 year flood will cause damage at Murray under any circumstance. The Murray facility is maintained in Alternatives SLC-1 and SLC-2.

Expansion of the Salt Lake City Suburban Sanitation District No. 1 facility to the north would require flood proofing to avoid flood hazards.

TERRESTRIAL ECOSYSTEM IMPACTS

Impacts on the natural terrestrial ecosystem of the Study Area have been divided into two categories:

1. Localized direct impacts result from the direct influence of plan implementation in the area of sewage works. Short-term direct impacts are associated with construction activities while long-term impacts relate to the disruption of the natural ecosystem over the life of the project.
2. Indirect ecosystem impacts are the result of growth and development related to plan implementation. These impacts are more difficult to assess because of the unpredictability of future development patterns.

Localized ecosystem impacts resulting from implementation of wastewater treatment alternatives are presented in Table V-7. The types of impacts can be divided into three groups which depend on the nature of the treatment alternative:

- . A - modification and expansion of existing treatment facilities will tend to impact a very small sphere of influence surrounding the facility. Such construction will induce localized short-term impacts, but long-term impacts would be minimal. The natural environment adjacent to existing facilities has undergone and adjusted to the stresses of construction and operation of the plant.
- . B - the next level of ecosystem impact results from those treatment alternatives which include the upgrading and expansion of existing facilities and the construction of new outfall lines or the consolidation of facilities with associate interceptor construction. In addition to the short-term localized impacts described in "A," there is the potential for severe short and long-term impacts resulting from construction of outfalls,

interceptors, and/or expanded regional plants. In most cases, new outfalls will cross virgin land, disrupting natural habitat during construction, and possibly permanently altering the pre-construction habitat. Major interceptor corridors will adversely affect terrestrial ecosystems during construction, particularly in undeveloped areas, and may have a long term impact resulting from the elimination of natural intolerant vegetal communities and the introduction of undesirable, tolerant, weedy vegetation. Regional facilities will require more land, thereby increasing the probability of ecosystem disruption, although the total land required by such regional facilities would probably be less than that needed to upgrade and expand all existing facilities.

C - If consolidation occurs and new regional treatment facilities are constructed, possibly with long outfalls, localized terrestrial ecosystem impacts are likely to be most severe. Under these alternatives, the greatest amount of new land is being committed to sewage works and, thus, is removed from the natural terrestrial habitat.

The size of the area to be consolidated, the length of the required connecting interceptors, and the type of habitat to be crossed all influence the severity of the adverse impacts discussed above. In addition to the above classifications, the following code was used in Table V-7 to identify the severity of these impacts:

- . S - smaller land commitment, short connecting distances, potential adverse impacts are low.
- . M - moderate land commitment and connecting distances, potential adverse impacts are moderate.
- . L - large land commitment and connecting distances, potential adverse impacts are great.

The types of short term, construction related impacts presented in Table V-7 include the generation of sediment loads, noise, and particulate matter. These factors may drive animals and bird life from the area, inducing pressure in other habitat areas. Air pollution from construction may stunt or kill vegetation in the immediate area, thus reducing habitat utility.

Archaeological sites occur throughout the entire region. At the level of planning available, it is not possible to determine which alternatives would affect known archaeological sites, however, alternative sewerage systems believed to be located near archaeological sites have been noted in Table V-7. Prior to construction, an archaeological reconnaissance of the area would be required. In the event artifacts were discovered during construction, work should be halted and the Utah State Historical Officer should be contacted.

Currently no designated historical sites are expected to be affected by implementation of any alternative.

Indirect terrestrial ecosystem impacts resulting from implementation of wastewater treatment alternatives and associated development patterns are presented in Table V-8. In assessing these development related impacts, consideration was given to the fact that, without strict land use controls, additional treatment plant capacity and major interceptors may induce scattered or sprawl development, thereby destroying terrestrial ecosystem habitat.

TABLE V-7

DIRECT ECOSYSTEM IMPACTS

<u>Alternative</u>	<u>Localized¹ Impact</u>	<u>Comments</u>
<u>DAVIS COUNTY</u>		
DC-1, DC-2	A	
DC-3, DC-4	B	. Commits Great Salt Lake to assimilate effluent directly for life of facility. . Outfalls may permanently alter marsh communities during construction to a point of no return.
DC-5, DC-6	B/L	. Commits Great Salt Lake to assimilate effluent directly for life of facility. . Interceptor may disrupt grass-sagebrush habitat types. . Interceptor may disrupt archaeological site.
DC-7, DC-8	B/M	. Same as DC-5, DC-6. . Interceptor may inhibit animal movement on corridor micro-environment.
DC-9	B/L	. Construction and long term commitment may severely disrupt Farmington Bird Refuge. . Commits corridor through Farmington Bird Refuge to sewer system. . Potential loss of waterfowl and marsh habitat. . Commits Great Salt Lake to assimilate effluent directly for life of facility. . Interceptor may disrupt archaeological site.
DC-10	B/S	. Same as DC-5, DC-6.
DC-12, DC-13	B/M	. Same as DC-7, DC-8. . If interceptor is located near Jordan River, disruption of streambank and riparian ecosystem is possible.
DC-Rec. Plan	B/M	. Interceptor may disrupt grass-sagebrush habitat types. . Interceptor may inhibit animal movement on corridor micro-environment. . Interceptor may disrupt archaeological site.
<u>SALT LAKE COUNTY</u>		
SLC-1, SLC-2	A	
SLC-3, SLC-4, SLC-5, SLC-9	B/S	. Interceptor line crosses Jordan River - disrupt streambank habitat types.

TABLE V-7 (Continued)

DIRECT ECOSYSTEM IMPACTS

<u>Alternative</u>	<u>Localized¹ Impact</u>	<u>Comments</u>
<u>SALT LAKE COUNTY (Con't)</u>		
		. Interceptor along Jordan River may further disrupt stream bank communities. . Interceptor may disrupt archaeological site.
SLC-6, SLC-10	B/M	. Same as above; interceptor has long corridor thus greater area for impacts to be demonstrated.
SLC-7, SLC-11	B/L	. Same as above.
SLC-8	B/L	. Commits Great Salt Lake to assimilate effluent directly for life of facility. . Disrupts Great Salt Lake marshlands. . Interceptor commits urban and rural land for wastewater conveyance. . Interceptor may disrupt archaeological site.
SLC-12	B/M	. Same as SLC-8.
SLC-Rec. Plan	B/L	. Interceptor may have great impact on habitat areas from Camp Williams to Murray. . Two crossings of Jordan River - disrupting stream banks. . Interceptor may disrupt archaeological site.
<u>NORTHERN UTAH COUNTY</u>		
NUC-1, NUC-2	A	
NUC-3, NUC-4	B	. Outfalls commit north end of Utah Lake to assimilate direct discharge of effluents. . Potential disruption of marshland due to construction and maintenance of outfall.
NUC-5, NUC-6	B/M	. Disruption of grass-sagebrush due to interceptor construction. . Micro-environment of interceptor corridor likely to be disrupted.
NUC-7	B/M	. Commit northern end of Utah Lake to assimilate direct discharge of effluents. . Potential disruption of Lake shore marshlands during construction and maintenance of outfall. . Same as NUC-5, NUC-6.

TABLE V-7 (Continued)

DIRECT ECOSYSTEM IMPACTS

<u>Alternative</u>	<u>Localized¹ Impact</u>	<u>Comments</u>
<u>NORTHERN UTAH COUNTY (Con't)</u>		
NUC-8	B/L	. Commits Utah Lake to assimilate effluents of four urban areas directly. . Potential disruption of shore line marshland. . Obligates long interceptor corridors to sewerage works.
NUC-9	B/L	. Commits long interceptor corridors to sewerage works.
NUC-10	C/L	. Commits land for facility and long interceptor line corridors and outfall line. . Commits Utah Lake to assimilate effluent discharge directly. . Potential disruption of shoreline-marshland. . Disruption to Provo River stream banks due to river crossing. . Outfall may disrupt archaeological sites.
NUC-11, NUC-12	C/L	. Same as NUC-10. . Discharge of effluent is directly to Provo Bay. . Potential disruption of Provo Bay ecosystem dynamics with outfall construction.
NUC-Rec. Plan	B/M	. Same as NUC-5, NUC-6.
<u>CENTRAL UTAH COUNTY</u>		
CUC-1, CUC-2	A	
CUC-3, CUC-4	B/S	. Interceptor corridor could disrupt particular habitat types of grass-sagebrush ecosystem. . Interceptor corridor micro-environment may be drastically changed.
CUC-5, CUC-6	B/M	. Interceptor corridor may create pressure/stress to marshland area at east end of Provo Bay. . Same as CUC-3, CUC-4.
CUC-7, CUC-8, CUC-9	B/M	. Same as CUC-5, CUC-6. . Commits Utah Lake to assimilate direct effluent discharge. . Outfall may disrupt shoreline marshland. . Outfall may disturb archaeological sites.

TABLE V-7 (Continued)
DIRECT ECOSYSTEM IMPACTS

<u>Alternative</u>	<u>Localized¹ Impact</u>	<u>Comments</u>
<u>CENTRAL UTAH COUNTY (Con't)</u>		
CUC-10	B/L	. Same as CUC-7, CUC-8, CUC-9. . Commits long interceptor corridor to sewerage works, thus increasing potential area of natural environment to be impacted.
CUC-11, CUC-12	B/L	. Same as CUC-10. . Commits Provo Bay to assimilate direct discharge of effluent. . May disrupt Provo Bay ecosystem dynamics. . May disrupt marshland adjacent to Provo Bay.
CUC-Rec. Plan	B/M	. Same as CUC-5, CUC-6, CUC-3, CUC-4.
<u>WASATCH COUNTY</u>		
WC-1	A	
WC-2	B	. Commits Provo River to assimilate direct effluent discharge. . Outfall may disrupt stream bank communities. . Commits grass-sagebrush habitats to outfall corridor.
WC-3, WC-5	C/M	. Same as WC-2. . Disrupts Provo River stream bank habitat with river crossing. . New facility commits land to life of facility.
WC-4	C/M	. Same as WC-3, WC-5 without Provo River impacts.
WC-6	B/L	. Commits large amounts of natural environment to interceptor corridor. . Impact to aesthetics of Provo Canyon great, especially during construction. . Requires two river crossings - streambank and stream may be disrupted. . Large area of grass-sagebrush habitat committed.
WC-Rec. Plan	C/M	. Same as WC-4.

TABLE V-7 (Continued)
DIRECT ECOSYSTEM IMPACTS

1

Key:

- A - modification and expansion of existing treatment facilities will tend to impact a very small sphere of influence surrounding the facility. Such construction will induce localized short-term impacts, but long-term impacts would be minimal. The natural environment adjacent to existing facilities has undergone and adjusted to the stresses of construction and operation of the existing plant.
- B - the next level of ecosystem impact results from those treatment alternatives which include the upgrading and expansion of existing facilities and the construction of new outfall lines or the consolidation of facilities with associate interceptor construction. In addition to the short-term localized impacts described in "A," there is the potential for severe short and long-term impacts resulting from construction of outfalls, interceptors, and/or expanded regional plants. In most cases, new outfalls will cross virgin land, disrupting natural habitat during construction, and possibly permanently altering the pre-construction habitat. Major interceptor corridors will adversely affect terrestrial ecosystems during construction, particularly in undeveloped areas, and may have a long-term impact resulting from the elimination of natural intolerant vegetal communities and the introduction of undesirable, tolerant, weedy vegetation. Regional facilities will require more land, thereby increasing the probability of ecosystem disruption.
- C - if consolidation occurs and new regional treatment facilities are constructed, possibly with long outfalls, localized terrestrial ecosystem impacts are likely to be more severe. Under these alternatives, the greatest amount of new land is being committed to sewage works and, thus, is removed from the natural terrestrial habitat.
- S - smaller land commitment, short connecting distances, potential adverse impacts are low.
- M - moderate land commitment and connecting distances, potential adverse impacts are moderate.
- L - large land commitment and connecting distances, potential adverse impacts are great.

TABLE V-8
INDIRECT TERRESTRIAL ECOSYSTEM IMPACTS

<u>Alternative</u>	<u>Ecosystem Impacted</u>	<u>Comments</u>
DAVIS COUNTY DC-1, DC-2; DC-3, DC-4	- Great Salt Lake Desert - Grass-Sagebrush - Jordan River Riparian	- Development pressure may tend to be isolated around existing urban centers. - Impacts to ecosystem may be less since surrounding habitats have been exposed to previous development. - Surrounding habitats could be disrupted greatest. - Impact may only be obvious where natural environment is eliminated.
DC-5, DC-6	- Great Salt Lake Desert - Grass-Sagebrush	- Development along interceptor could disrupt aesthetic and environmental quality of Great Salt Lake marshland. - Development could tend to be concentrated along interceptor line, reducing pressures in other areas. - Habitats along interceptor could exhibit a "squeezing out" with pressures increasing in center area (the last hold out). - Development could disrupt migratory routes of wildlife from Wasatch Front to Great Salt Lake - seasonal and daily and around shoreline.
DC-7, DC-8	- Great Salt Lake Desert - Jordan River Riparian - Grass-Sagebrush - Agricultural	- Development may disrupt recreational use of Great Salt Lake marshland due to interceptor induced growth (i.e., gun clubs). - Reduction of native environments used by wildlife migration from agricultural land. - Disruption of local wildlife migratory routes. - Development could "drive off" marshland wildlife. - Development may eliminate habitats because of the introduction of toxics.

TABLE V-8 (Continued)

INDIRECT TERRESTRIAL ECOSYSTEM IMPACTS

<u>Alternative</u>	<u>Ecosystem Impacted</u>	<u>Comments</u>
<u>DAVIS COUNTY (Con't)</u>		
DC-9	- Great Salt Lake Desert - Jordan River-Riparian - Grass-Sagebrush - Agricultural	- Development should not occur on Farmington Bay Bird Refuge. - Development could cluster around Farmington Bird Refuge thus increasing stress on diverse wildlife populations. - Disruption of migratory routes is possible. - Encroachment onto riparian habitats due to "bunch" development at South Davis South. - Impacts from non-point sources could change. - Intolerant species may be forced out.
DC-10, DC-11	- Jordan River-Riparian - Grass-Sagebrush - Agricultural	- Disruption of migratory routes from Jordan River stream-banks to agricultural - grass-sagebrush. - Limited sprawl development along interceptor thus limited habitat impact due to interceptor. - Development may be more urban center oriented, places stress on perimeter habitats.
DC-12, DC-13	- Jordan River-Riparian - Grass-Sagebrush - Agricultural - Great Salt Lake Desert	- Cumulative of DC-7, DC-8, DC-10, DC-11. - Regional system could support higher densities thus increasing degree and number of habitats impacted.
DC-Rec. Plan	- Great Salt Lake Desert - Jordan River-Riparian - Grass-Sagebrush - Agricultural	Same as DC-7, DC-8.

TABLE V-8 (Continued)

INDIRECT TERRESTRIAL ECOSYSTEM IMPACTS

<u>Alternative</u>	<u>Ecosystem Impacted</u>	<u>Comments</u>
<u>SALT LAKE COUNTY</u>		
SLC-1, SLC-2; SLC-3, SLC-4, SLC-5, SLC-9, SLC-12	- Jordan River-Riparian - Grass-Sagebrush - Agricultural	- Development may impact only perimeter habitats. - Expansion of urban areas may eliminate streambank communities, stressing them to more urban tolerant species. - Communities west of SLC metropolitan area could impact communities which buffer agricultural habitat.
SLC-6, SLC-7, SLC-8, SLC-10 SLC-11	- Jordan River-Riparian - Grass-Sagebrush - Agricultural	- Same as above. - Eliminate or disrupt habitats now separating urban areas south of SLC. - Disrupt migratory routes from Wasatch Front to Jordan River.
SLC-Rec. Plan		Same as above.
<u>NORTHERN UTAH COUNTY</u>		
NUC-1, NUC-2, NUC-3, NUC-4	- Grass-Sagebrush - Agricultural - Utah Lake-shoreline	- Greatest impacts to surrounding habitats. - Development of agricultural land may limit available agricultural habitat. - Development toward bodies of water will increase stress which would result in removal of particular species and habitats. - Increase pressure to upland game near urban areas.
NUC-5, NUC-6, NUC-7	- Grass-Sagebrush - Agricultural - Utah Lake-shoreline	- Reduces agricultural - grass-sagebrush habitat. - Disruption of migratory routes to Utah Lake from north. - May tend to concentrate development along interceptor, reduces stress on other habitats. - Could increase and change character of non-point pollution to a degree that other impacts are created.

TABLE V-8 (Continued)

INDIRECT TERRESTRIAL ECOSYSTEM IMPACTS

<u>Alternative</u>	<u>Ecosystem Impacted</u>	<u>Comments</u>
<u>NORTHERN UTAH COUNTY (Con't)</u>		
NUC-8, NUC-9	- Grass-Sagebrush - Utah Lake-shoreline - Agricultural	- Could lead to displacement of wildlife creating population pressures in other habitats around Utah Lake. - May disrupt migratory routes. - Could create sprawl along interceptor thus reducing or eliminating large areas of habitat. - Create increases and variations in non-point pollutants. - Reduce aesthetics of Utah Lake and Wasatch Mountains. - Concentrated development could create stress sufficient to drive wildlife to other areas and/or increase wildlife densities thus producing internal stress.
NUC-10, NUC-11, NUC-12	- Grass-Sagebrush - Utah Lake - shoreline - Utah Lake - Provo Bay - Agricultural - Provo River-Riparian	- Same as NUC-8, NUC-9. - Development along Provo River could disrupt streambank habitats. - Development near Provo Bay could disrupt diverse ecosystem.
NUC-Rec. Plan	- Grass-Sagebrush - Agriculture - Utah Lake-shoreline	Same as NUC-5, NUC-6, NUC-7.
<u>CENTRAL UTAH COUNTY</u>		
CUC-1, CUC-2	- Grass-Sagebrush - Agriculture	- Impact to natural environment probably will be on urban perimeter. - Agricultural habitat may experience minimal impact.

TABLE V-8 (Continued)

INDIRECT TERRESTRIAL ECOSYSTEM IMPACTS

<u>Alternative</u>	<u>Ecosystem Impacted</u>	<u>Comments</u>
<u>CENTRAL UTAH COUNTY (Con't)</u>		
CUC-3, CUC-4	. Grass-Sagebrush . Agricultural	. Same as CUC-1, CUC-2. . Interceptor corridor could direct growth thus increasing development pressure on habitats.
CUC-5, CUC-6, CUC-7	. Grass-Sagebrush . Agricultural . Utah Lake - Provo Bay	. Agricultural habitat could be reduced near Provo Bay disrupting food areas for wildlife. . Disrupt migratory routes to and from Provo Bay on east side. . Increase and change character of non-point pollution to Provo Bay. . Development could disrupt nesting area at east end of Provo Bay. . Concentrated and direct development may reduce stress on other habitats.
CUC-8, CUC-9	. Grass-Sagebrush . Agricultural . Utah Lake - Provo Bay	. Same as CUC-5, CUC-6, CUC-7. . Agricultural habitats may not be as greatly disrupted.
CUC-10, CUC-11, CUC-12	. Grass-Sagebrush . Agricultural . Utah Lake - Provo Bay	. Potential for disruption of migratory routes. . May increase pressure on Provo Bay so that nesting is disrupted and intolerant species removed. . Increase and change in non-point pollution could alter Provo Bay dynamics. . May reduce agriculture habitats and feed/cover areas.
CUC-Rec. Plan	. Grass-Sagebrush . Agriculture . Utah Lake - Provo Bay	. Encouraged growth along interceptors would encourage open space thus contributing aesthetic value. . All impact to Provo Bay mentioned previously. . Reduction in agricultural habitat possible.

TABLE V-8 (Continued)

INDIRECT TERRESTRIAL ECOSYSTEM IMPACTS

<u>Alternative</u>	<u>Ecosystem Impacted</u>	<u>Comments</u>
<u>WASATCH COUNTY</u>		
WC-1, WC-2	. Grass-Sagebrush	. Major impacts may be restricted to perimeter habitats.
WC-3, WC-4, WC-5	. Grass-Sagebrush . Provo River-Riparian	. Corridor development may disrupt habitats. . Disruption of stream bank possible. . Migratory routes may be disrupted. . Non-point pollution may increase and change.
WC-6	. Grass-Sagebrush . Provo River-Riparian . Provo River-Canyon	. Disruption to Provo River streambanks. . Disruption of canyon habitats including nesting area. . Disruption of migratory routes verticle in canyon. . Increase and change in non-point pollution may reduce Provo River value as high quality fishery. . Aesthetics of canyon may be reduced.
WC-Rec. Plan	. Grass-Sagebrush . Provo River-Riparian	. Same as WC-4.

A majority of the land between urban centers is within the grass-sagebrush ecosystem but is being utilized for agriculture. This has created large acreages of unique habitat types which in particular situations has resulted in a more favorable habitat for particular species of wildlife. Grain fields provide food and cover for particular upland game species and small mammals. Orchards provide food, cover, and nesting areas for several forms of "aesthetic" wildlife (i.e., song birds, game birds, etc.). Disruption of these habitats through agricultural practices has generated stresses on the wildlife, yet over years of continued cyclic cultivation many species have adapted and new species have been encouraged.

Development of agricultural lands will not necessarily result in elimination or disruption of particularly unique vegetation associations, but the elimination of tilled acreage and a commitment of it to development will place increased pressure on the wildlife that is dependent upon the man-influenced habitat.

Development will likely disrupt existing known archaeological sites and possibly uncover new ones. To preserve existing known sites, land use management should be implemented which will guarantee their preservation.

ARCHAEOLOGICAL AND HISTORICAL RESOURCES

Three principal prehistoric cultures have been identified that occupied the Salt Lake-Utah Lake Valleys. These cultures include:

- . Desert Archaic
- . Sevier-Fremont
- . Numic Speaking Peoples.

The Desert Archaic occupied the area around 6000 B.C. and is the earliest identified culture of the Study Area. Living in open camps or caves, these people were hunters and gatherers. The Sevier-Fremont culture developed between 500 and 1300 A.D. The culture is characterized by small scale agriculture with considerable dependence on hunting and gathering. Aggregated into farming units, these people lived in settled villages of a more permanent nature than the Desert Archaic. Somewhere around 1200 to 1300 A.D. the Numic Speaking people arrived in Utah and existed into historic times. The Shoshoni Indians are representative of this culture. This culture was basically a hunting and gathering society living in open camps.

All three cultural groups were likely to locate along the Jordan River-Utah Lake watercourses and, as a consequence, there are likely to be undiscovered settlement sites in the Study Area.

A small party of Mormon pioneers led by Brigham Young entered the Salt Lake Valley on July 24, 1847, to establish a permanent settlement. In spite of the lateness of the season, crops were planted and irrigated by irrigation systems the settlers established, and crops were harvested that fall. Within 2 years the town of Salt Lake City had a population of 5,000. The town was laid out in square 10-acre blocks that were oriented in north-south and east-west directions. Wide streets were provided between the blocks, and areas were set aside for parks, churches, businesses, and similar uses at the time the city was laid out. Most of the roads in the area are still square with the cardinal points of the compass.

Brigham Young, president of the Mormon Church, sent an exploration party into southern Utah County in 1847. In 1849, John S. Higbee, who

had been in the first exploration party, and 30 families, about 150 people, built Fort Utah along the Provo River, about 2.5 miles west of the center of the present City of Provo. The fort wall was 14 feet high and the log houses were on the inside. Small settlements, or towns, were soon established about 6 miles apart for a distance of about 500 miles. These settlements were Mountainville (Alpine), Lehi City, American Fork, Battle Creek (Pleasant Grove), Provo City, Springville, Palmyra City (Spanish Fork), Payson, and Summitville (Santaquin). The people lived within the town limits and farmed areas outside the towns.

During the effort to inventory and analyze the potential impacts on archaeological and historic resources the following sources of information were contacted:

- . Utah State Historical Society - State Archaeologist
- . Brigham Young University - Department of Anthropology
- . University of Utah - Department of Archaeology
- . Utah State University - Department of Archaeology
- . Utah Museum of Natural History

Through the data collected from these sources, a total of 148 surveyed archaeological sites and 212 historical sites were identified. Surveyed archaeological sites by county are:

- . Davis County - 20 sites
- . Salt Lake County - 47 sites
- . Utah County - 81 sites

There are currently no known archaeological sites within Wasatch County, but this is more a consequence of the paucity of surveys in the County rather than the area not being inhabited by historic cultures. Burial mounds and pits, pottery, and tools have been uncovered in all three counties. Petroglyphs (rock carvings) have been surveyed in Utah County, lithics (tools) in Salt Lake County, and metate (grinding stones) in Davis County. Other findings include skeletons, arrow heads, houses, and composites.

Of the total of 212 identified historical sites in the Study Area, 27 exist in Davis County; 18 on the State Register and nine (9) on the Centennial Register. Salt Lake County has 129 identified historical sites; seven (7) on the Centennial Register, 86 on the State Register, 23 on the National Register, and 13 nominated for the National Register. Forty-nine identified historical sites occur in Utah County; five (5) on the Centennial Register, 33 on the State Register, five (5) on the National Register. Wasatch County has five (5) sites while Juab County has two. Most of these identified historical sites are private homes and public buildings.

Because exact locations of new treatment plants and interceptor sewer lines are not given in the Plan but will be determined in the 201 facilities planning process, it is impossible to determine for certain if conflicts exist with known archaeological and/or historical sites or to even survey a particular site for evidence until such sites and corridors are preliminarily located. Although a survey of the general regions suggested for facilities would be impractical at this time, an attempt was made to determine the potential for disturbance of archaeological and historic sites based on the level of information available. The results of this analysis are presented in Table V-7. The term "disrupt" in the context of archaeological and/or historic sites in Table V-7 is intended to infer possible direct impacts during construction.

ECONOMIC IMPACT

Because all alternative wastewater management strategies were based on the same future land use projection, no differences in induced employment can be assessed. Suffice it to say that any plan alternative will accommodate employment projections as presented in the Plan.

In addition to future employment projections, the Plan alternatives will generate some construction and related employment. To illustrate, the recommended plan will account for \$77.5 million in capital investment for construction of sewage works. Assuming that 40 percent of this investment is labor, \$31 million of total salary would be generated over the 20 year planning period or \$1.55 million per year. At \$15,000 per man-year for a construction worker, this would be a little over 100 construction jobs supported annually by projects evolving from the recommended plan. These jobs represent 0.8 percent of the total construction labor force in the Study Area in 1971. Assuming two service related jobs for each construction job, the annual service labor force would have 200 employees (0.3 percent of 1971 employees) supported by the activities related to plan implementation. Neither of these two employment categories are deemed to be significantly impacted by plan implementation. Other employment categories stimulated by implementation of the plan, but not considered above are: treatment plant operating personnel, employees associated with infiltration/inflow correction, and service employees related to these two categories. These categories are also deemed to result in no major impacts on Study Area employment.

There may be significant economic losses due to the development of agricultural land. In 1969, the total market value of Study Area agricultural products sold was \$54.5 M. Due to a forecasted net loss of 32,114 acres of agricultural land by 1995, the reduced sale of agricultural products is estimated to cost \$6.5 M by 1995 or 12 percent of 1969 levels. It should be noted that this loss could be offset by increases in other market sectors.

FINANCIAL IMPACT

Financial impacts of the wastewater treatment alternatives include the impact on each jurisdiction's capacity to issue bonds to finance construction. Bonding capacity to finance capital improvements such as construction of wastewater treatment facilities is dependent upon a jurisdiction's assessed value which determines the maximum legal limit and the outstanding indebtedness, which, in turn, determines the remaining bonding capacity. The 1973 remaining bonding capacity for each major service area, and the capital cost of the most expensive alternative, the recommended plan, and the recommended plan with secondary treatment are presented in Table V-9. Capital costs for the local service area assuming 75 percent Federal funding through the EPA wastewater treatment facilities grants are also presented in Table V-9. If the most expensive alternatives were implemented, only Northern Utah County would have sufficient remaining bonding capacity, \$16.58 M, for projects totalling \$14.91 M. If 75 percent Federal funding were used, all areas would have sufficient remaining bonding capacity even with implementation of the most costly treatment alternatives. If the recommended plan were implemented, Davis County and Central Utah County would need Federal funding in order not to exceed the local bonding capacity for construction costs. Central Utah County would still need Federal funds, even if the recommended plan with secondary treatment was implemented.

TABLE V-9

1973 BONDING CAPACITY AND CAPITAL COSTS OF WASTEWATER TREATMENT

Service Area	1973 Bonding Capacity (\$106)	1975 Capital Costs		
		Highest Cost (\$106)	Recommended Plan (\$106)	Recommended Plan at Secondary Treatment (\$106)
Davis County	10.095	23.77 a)(5.94)	10.35 a)(2.59)	3.22 a)(0.81)
Salt Lake County	43.484	82.73 (20.68)	38.72 (9.68)	22.72 (5.68)
Northern Utah County	16.584	14.91 (3.73)	8.61 (2.15)	5.31 (1.33)
Central Utah County	16.678	29.64 (7.41)	19.39 (4.85)	18.95 (4.74)
Wasatch County	1.983	b)4.65 (1.16)	0.95 (0.24)	c)0 (0)

a) Local capital cost with 75 percent Federal funding.

b) Includes only the cost of the interceptor to Provo.

c) Does not include cost of infiltration control and assumes controls would be such that, even with population growth, existing treatment plant capacities would be sufficient.

The recommended plan at secondary treatment in Wasatch County presents a unique situation. In deriving the required capital cost, infiltration/inflow control was assumed but not included in construction costs. The assumed level of infiltration/inflow control was such that even with population growth, the Midway and Heber treatment facilities will have sufficient capacities. Additionally, with secondary treatment at these two facilities, there is no need for a new facility at Charleston at secondary treatment, thus total capital cost in Wasatch County for the recommended plan with secondary treatment is presented as zero in Table V-9. However, it should be noted that the cost of infiltration/inflow control could be significant.

It should be noted that as existing debts are paid off and new growth occurs the remaining bonding capacities as presented in Table V-9 are likely to increase. Additionally, all projects would not be built at once, therefore only a portion of the bonding capacity would be used and a portion paid off before further issues would occur.

The data in this Table can be used to assess the potential impact of constructing wastewater treatment facilities in each major service area but cannot be used to assess financial impacts for any individual jurisdiction contemplating construction. Notwithstanding the above area-wide conclusions, individual jurisdictions may realize more or less impact.

SOCIAL IMPACTS

It is rather difficult to pinpoint any changes which may occur in the social characteristics, attitudes, activities, or life styles of Study Area residents as a result of wastewater treatment alternatives. Any set of alternatives by itself is not going to upgrade water quality to such a level that new recreational activities would be available (increased trout fishing or increased body contact water sports). More appropriately, the alternatives will help maintain the current status of these activities. The exception to this situation is in Provo Canyon. If the Provo Canyon interceptor is constructed, the Canyon may experience extreme recreational pressure as a result of residential, commercial, and recreational development. Any changes in life style, if they occur, will result from population growth or land use changes. Land use conversion from agriculture to residential and commercial activities resulting from interceptor locations may influence life styles in the areas of new development, but it is difficult to say what these changes might be.

If some approach to water quality management was not implemented, a noticeable deterioration in water quality could be expected. In this event, some life style changes could result. For example, Utah Lake and Jordan River are both used for recreational activities. A deteriorated water quality would have a possible impact on the continuation of these activities and the demand for other recreational activities would increase. This may require increased spending for local parks and recreational facilities, or an increase use of mountain recreation sites. This could also result in higher recreational costs for many families who cannot afford to travel greater distances to other recreation sites.

It is possible that the Plan could have an impact on residents and their activities in those instances where sewer plant expansions occur in proximity to residential areas. Increased odor could curtail outdoor activities or reduce one's satisfaction with their neighborhood. This could result in more moves by nearby residents, or the change from an area occupied by owners to an area occupied by renters. Or, it may eventually result in pressures to change the land use to some non-residential category.

CHAPTER VI

AIR QUALITY IMPACTS

INTRODUCTION

In order to evaluate the impact on air quality of land use plans associated with or influenced by the wastewater treatment alternatives developed in the Plan, it is necessary to make air quality projections into the future by using air pollution dispersion models. A variety of models are available which employ mathematical formulations to describe the physical air quality system. These models utilize topographic and meteorologic data as input to predict the fate of air pollutants emitted by a variety of sources. Because of the large quantities of input data and the numerous calculations which must be made, most available air quality models are best executed by modern computers.

Once a model is selected and adapted to a particular air basin its input data, for a time period for which monitored data are available, are inserted and air pollution concentrations are calculated for that period. These values are compared with the monitored data to assess the reliability of the model to make predictions. If agreement between calculated and observed concentrations is good, the model may be accepted as reliable to predict future air quality.

Future land use projections are then translated into air pollution source data and inserted into the model. The model then is used to calculate (predict) future concentrations of air pollution in a basin. Comparison of these predicted concentrations with standards allows a determination of the expected impact on air quality of future land use plans.

The following section of this Chapter contains a brief summary of the model used to evaluate the air quality impacts of the Plan, the required input data, and the model verification using existing monitoring data. The details of this information base are presented in Volume B-1000, "Air Quality Modelling," of the Study Task Report Series. Subsequent sections of this Chapter contain the results of air quality impacts resulting from the land use plan associated with the various wastewater treatment alternatives presented in the Plan.

DESCRIPTION OF MODEL

Selection of Model

The choice of atmospheric pollutants to be studied, carbon monoxide (CO) and total suspended particulate (TSP), influenced the choice of dispersion models. Selection of carbon monoxide meant that particular attention would have to be given to line and area source (automotive) emissions, and that one hour and eight hour concentrations would have to be predicted. Particulates are emitted by line, point, and area sources, thus the model should be able to utilize all types of pollutant sources. TSP concentrations are to be predicted for 24 hours and annual averages, and are assumed not to be chemically reactive in significant

amounts over periods of exposure of interest. Because highly reactive pollutants were excluded from this Study, steady-state nonreactive pollutant models could be employed. Additionally, inversions frequently occur in the Study Area, thus models employed should contain some procedure for accounting for the height of mixing layers limited by inversions.

Several considerations influenced the selection of a combined modelling approach, whereby both CO and TSP would be modelled on a short term (1-hour, 8-hours) and annual average basis and the approach which best matched observed data would be used to evaluate future air quality impacts.

First, it was assumed that the "worst-case" 24-hour period for CO would also serve as the representative period for TSP. It was recognized that worst conditions for CO probably include low wind speeds, while "worst conditions" for TSP may include high wind speeds and dust storms. These conditions of high particulate loading were observed in the monitored data and were attributed to fugitive dust from open fields during non-growing seasons when wind speeds were high. These situations also would tend to occur in the future almost independently of regional growth and water quality plans. They would be affected to some degree, of course, because growth would tend to eliminate some fugitive dust sources, e.g., by building residential areas on present farm lands, although, in this example, some fugitive dust could be generated through construction and sanding of more roads. However, emphasis was placed on determining worst conditions for man-made rather than fugitive particulates, thus the assumption that those conditions associated with CO were also suitable for TSP. The reader should recognize that the 24-hour TSP concentrations calculated using these assumed "worst case" conditions are not directly comparable to the EPA 24-hour standards. However, the TSP predictions under these assumed meteorological conditions will provide a good estimate of the future trends in ambient particulate concentrations.

Second, the lack of a suitable existing model for the Study Area meant that model development would be necessary, and that a complete and consistent data base would have to be assembled. Because no single model with the required capability (i.e., short and long-term calculations for line, area, and point sources) was available, it became necessary to adapt other models to the Utah situation. These models hereinafter designated UTAIR, represent steady state, non-reacting pollutant conditions. The model used for the short term calculations is the RAM model (150) developed by EPA while the annual average model is an adaptation of models used elsewhere for evaluating air quality impacts of future land use plans.

Both the short-term and long-term models operate from the same emission source data base. For the short-term model, hourly meteorological data for particular days were used. For the long-term and 24-hour model, frequency distributions of meteorological data were used for either a full particular day or an average year.

In the short-term model, for each case calculated, no background concentrations of CO were added, but for TSP a background concentration of 20 ug/m³ (141) was added to all calculated concentrations.

Grid System

Most air quality models, including the UTAIR system, utilize a grid network to locate emission sources and predicted air quality concentrations. The grid network used with the UTAIR system is comprised of two mile square grids for the Salt Lake Air Basin as illustrated in Figure VI-1 and 1.5 mile square grids for the Provo Air Basin as illustrated in Figure VI-2. Receptors, or locations of predicted pollutant concentrations, are located at grid intersections. Special receptors were located at the existing air quality monitoring stations discussed in Chapter II. Calculation for future pollutant concentrations were made at a total of 226 receptor locations in the Salt Lake City basin and at 327 receptor locations in the Provo basin. From these calculated values isopleths showing equal concentration contours were drawn.

DATA BASE FOR MODEL APPLICATION

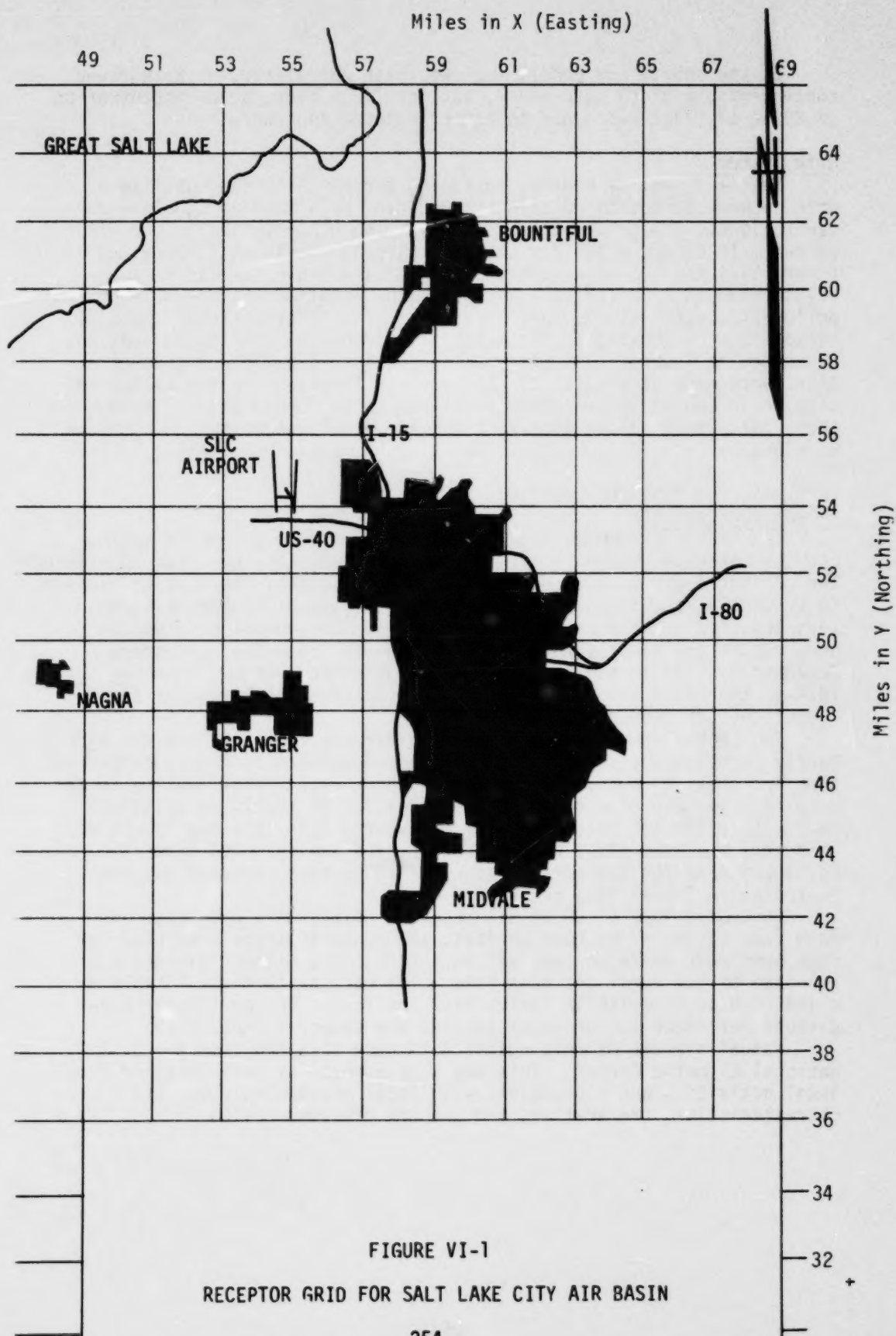
Meteorological Data

The short-term model mode of UTAIR was used to determine maximum one hour average concentrations. The input data were selected by examining the monitored air quality data for 1974 to find those periods of highest CO concentrations in each air basin. Eight days of high concentrations were selected. These were further screened for unusual or atypical occurrences and finally reduced to one day for each basin, Monday, December 2, 1974 in the Salt Lake City basin and Tuesday, November 12, 1974 in the Provo basin. These days are referred to herein as the "worst day" or "worst case."

The short-term model requires considerable computer time for each hourly calculation; thus, procedures were developed to reduce computing time and costs to reasonable amounts without sacrificing realism in the results. Instead of exercising the model for 24 hourly calculations each with different meteorological and source data, the one "worst day" data were examined and a worst 8-hour period was selected from it. Pertinent data for the worst 8-hour period in each selected day are presented in Tables VI-1 and VI-2.

Concentrations of CO at all receptor points were predicted for each hour of the eight hour periods, and concentrations predicted for each hour were averaged over all receptors. The highest average was selected as the worst one hour case. For each basin these times are shown with an asterisk in Tables VI-1 and VI-2. The particular conditions for these two one-hour periods are shown in Table VI-3.

Annual average meteorological data were obtained from the U. S. National Climatic Center. This was supplemented by data obtained from local activities and discussions with local meteorologists. Its characteristics, preparation, and use are discussed below.



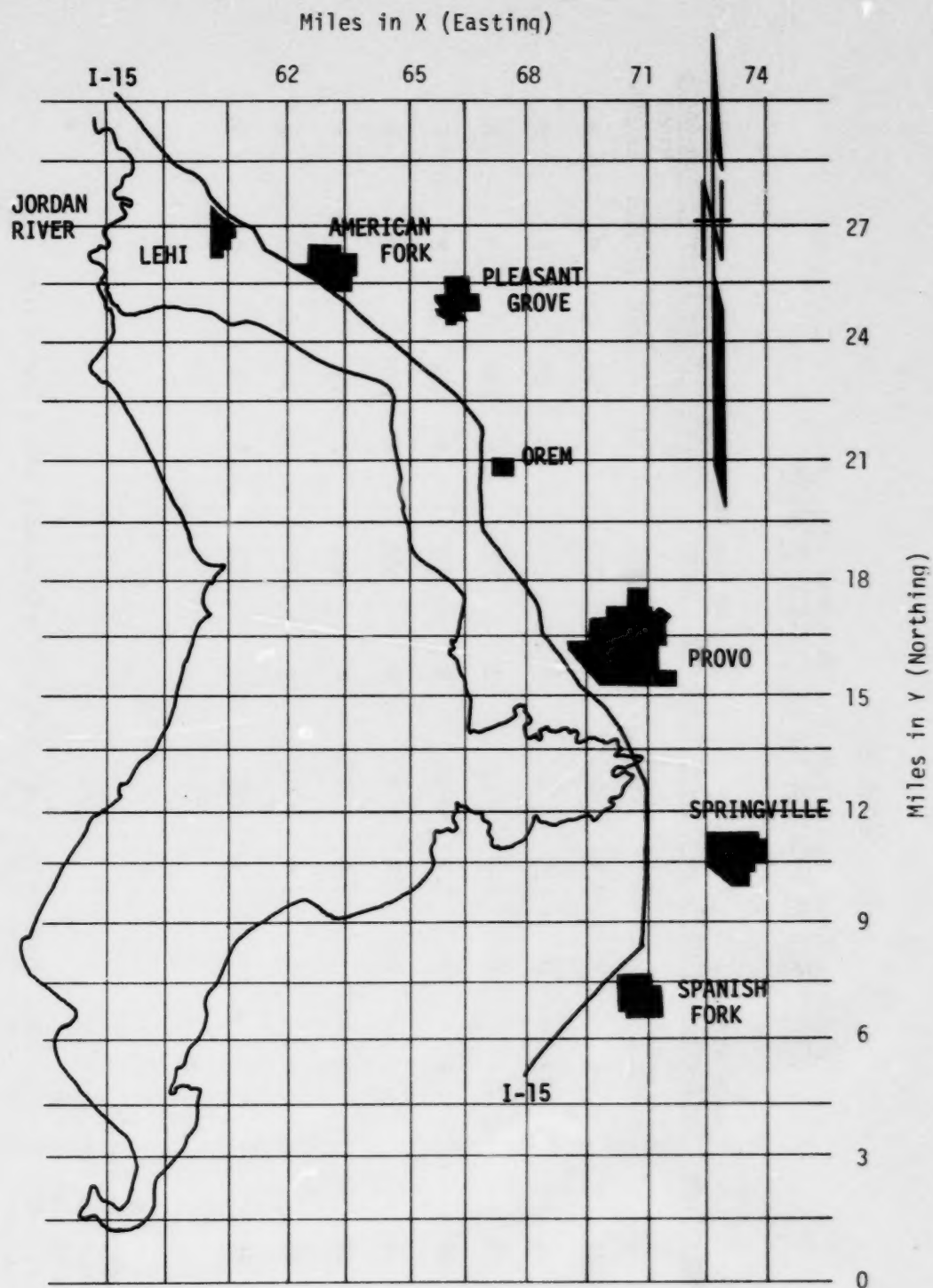


FIGURE VI-2
RECEPTOR GRID FOR PROVO AIR BASIN

TABLE VI-1

METEOROLOGICAL CONDITIONS FOR THE WORST CASE DAY
(DECEMBER 2, 1974) IN THE SALT LAKE CITY BASIN

Time of Day	Temperature T(°F)	Temperature Difference		Wind Speed		Wind Direction		Mixing Stability Class		Cloud Cover		Sun Angle	
		T-51°F		knots	m/sec	Degree	Sector	Depth Feet	1-5	%	Type	Height	Night Slight
Z	MST												
14	7	26	-25	4	2.1	140	7	200	5	60	C	M	N
15	8*	24	-27	0	1.5	0	7	200	5	60	C	M	N
16	9	28	-23	5	2.6	160	8	200	4	100	O	M	N
17	10	32	-19	4	2.1	180	9	325	4	100	O	M	S
18	11	36	-15	0	1.5	0	9	550	4	100	O	M	S
19	12	41	-10	0	1.5	0	4	1450	2	20	C	M	S
20	13	45	-6	4	2.1	70	4	1900	3	20	C	H	S
21	14	45	-6	10	5.1	300	14	1900	4	30	C	H	S

LEGEND:

- * Worst one hour.
- Mountain Standard Time.
- meters per second.
- 22½ degree arcs measured from north, e.g., Sector 1 refers to a wind blowing from the north, Sector 9 is a south wind.
- Turner's classifications of atmospheric stability: 1 (very unstable), 2 (unstable), 3 (slightly unstable), 4 (neutral), 5 (stable).
- Amount of cloudiness: C (less than 5/8 cloud cover), B (5/8 to 7/8 cloud cover), or 0 (more than 7/8 of sky obscured by clouds).
- mean level of cloud base: L (less than 7,000 feet above ground), M (7,000 to 20,000 feet), or H (over 20,000 feet).
- Sun angle: N (night-from one hour before sunset to one hour after sunrise), S (sun angle between 15 and 35 degrees from the horizon), M (35 to 60 degrees), or ST (greater than 60 degrees).

TABLE VI-2

METEOROLOGICAL CONDITIONS FOR THE WORST CASE DAY
(NOVEMBER 12, 1974) IN THE PROVO BASIN

<u>Time of Day</u>			<u>Temperature</u>		<u>Wind Speed</u>		<u>Wind Direction</u>		<u>Mixing Stability</u>		<u>Cloud Cover</u>		<u>Sun Angle</u>	
<u>Z</u>	<u>MST</u>	<u>T (°F)</u>	<u>Difference</u>		<u>knots</u>		<u>Degree</u>		<u>Depth</u>		<u>Class</u>		<u>Night</u>	
			<u>I-51°F</u>		<u>m/sec</u>		<u>Feet</u>	<u>1-5</u>	<u>%</u>	<u>Type</u>	<u>Height</u>	<u>Slight</u>		
24	17*	50	-1		5	2.2		15		2243	4	100	0	N
1	18	45	-6		4	1.8		11		2064	4	90	0	N
2	19	44	-7		3	1.5		5		1886	4	100	0	N
3	20	42	-9		4	1.8		7		1707	4	100	0	N
4	21	41	-10		3	1.5		15		1529	4	100	0	N
5	22	39	-12		2	1.5		1		1350	4	100	0	N
6	23	39	-12		3	1.5		15		1171	4	100	0	N
7	24	38	-13		3	1.5		11		993	4	100	0	N

LEGEND:

- * - Worst one hour.
- MST - Mountain Standard Time.
- m/sec - meters per second.
- Sector - 22½ degree arcs measured from north, e.g., Sector 1 refers to a wind blowing from the north, Sector 9 is a south wind.
- Class - Turner's classifications of atmospheric stability: 1 (very unstable), 2 (unstable), 3 (slightly unstable), 4 (neutral), 5 (stable).
- Type - Amount of cloudiness: C (less than 5/8 cloud cover), B (5/8 to 7/8 cloud cover), or 0 (more than 7/8 of sky obscured by clouds).
- Height - mean level of cloud base: L (less than 7,000 feet above ground), M (7,000 to 20,000 feet), or H (over 20,000 feet).
- Sun Angle - N (night-from one hour before sunset to one hour after sunrise), S (sun angle between 15 and 35 degrees from the horizon), M (35 to 60 degrees), or ST (greater than 60 degrees).

TABLE VI-3

METEOROLOGICAL CONDITIONS FOR WORST HOUR OF WORST DAYS

For each air basin the specific worst one hour conditions are given below.

SALT LAKE CITY BASIN

Day : Monday, December 2, 1974
Time : 0800 hours
Temperature : 24°F.
Temperature difference from annual average : -27°F.
Wind speed : less than 1.5 m/sec (calm)
Wind direction : SE
Inversion Height (mixing depth) : 61m
Cloud cover : 60%, type less than 63% (clear), height 14,000 feet
Sun angle : less than 15°
Stability class : 5 (stable)

PROVO BASIN

Day : Tuesday, November 12, 1974
Time : 1700 hours
Temperature : 50°F
Temperature difference from annual average : - 1°F.
Wind speed : 2.2 m/sec
Wind direction : NW
Inversion Height (mixing depth) : 684m
Cloud cover : 100%, type greater than 88% (overcast), height 25,000 feet
Sun angle : less than 15°
Stability class : 4 (neutral)

Salt Lake City Basin - Annual Average Conditions

Meteorological data for the Salt Lake City area was derived from the Salt Lake City Airport weather station. A wind rose, taken from the CHES study (142) for this station for the period 1951-1960, is presented in Figure VI-3. It is felt that this wind rose is indicative of conditions similar to those used in this Study.

Figure VI-3 illustrates that approximately 50 percent of the winds are from the south to southeast and approximately 25 percent are from the west-northwest to north. These are the predominant winds while the remaining winds occur from all other directions.

The predominant southeast winds with a mean speed of 7 mph are primarily downslope during the nighttime which includes the morning hours. The northwest winds with a mean speed of 9 mph are mostly the afternoon and early evening upslope winds.

Meteorological data from the Salt Lake City Airport were used to formulate annual average conditions of wind direction, wind speed, and atmospheric stability which is a measure of the turbulence that causes dispersion of pollutants. A frequency distribution of the number of times winds of a certain speed would be in certain directions when the atmosphere was in a particular condition of stability was prepared from this analysis and used in the predictive model.

Provo Basin - Annual Average Conditions

Meteorological data similar to that obtained from the Salt Lake City Airport is not available for the Provo Basin. However, Brigham Young University (BYU) has compiled four years of wind data (1963-1966) at a station on campus. These data are illustrated in Figure VI-4. Stability-related data from the Salt Lake City Airport station were used to derive atmospheric stability distributions for the BYU station because such information was not available for the campus station. This procedure adds uncertainty to the model predictions for the air basin, but represents the best use of existing data.

Emission Data

Emission inventories were developed for 1974 and 1995. Three types of emission sources (point, area, and line) were considered. The estimated total annual emissions for carbon monoxide (CO) and total suspended particulates (TSP) for each type of source are presented in Table VI-4 and discussed below:

- A. Point sources. Point source data were taken from the ongoing Pacific Environmental Services (PES) study for Utah and from the State of Utah - Department of Social Services, Division of Health files of emission notices. As illustrated in Figures VI-5 and VI-6, 47 point sources were identified in the Salt Lake City basin and 17 sources in the Provo basin. Total emissions from these sources are estimated to remain almost constant between 1974 and 1995.

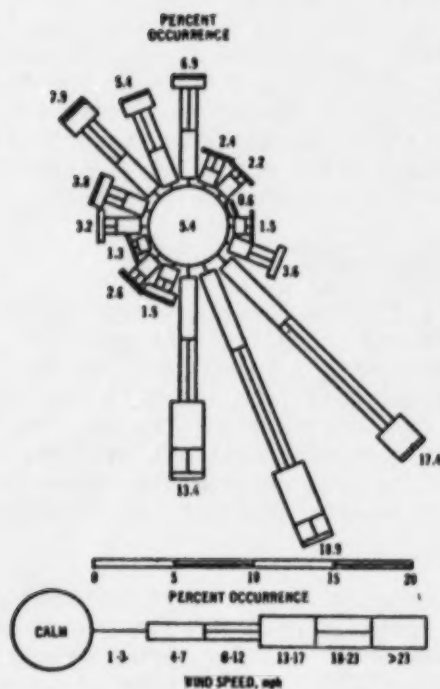


FIGURE VI-3

SURFACE CLIMATOLOGIC WIND ROSE,
SALT LAKE CITY AIRPORT (1951-1960)

FIGURE VI-4
WIND DATA - BRIGHAM YOUNG UNIVERSITY
1953 - 1966

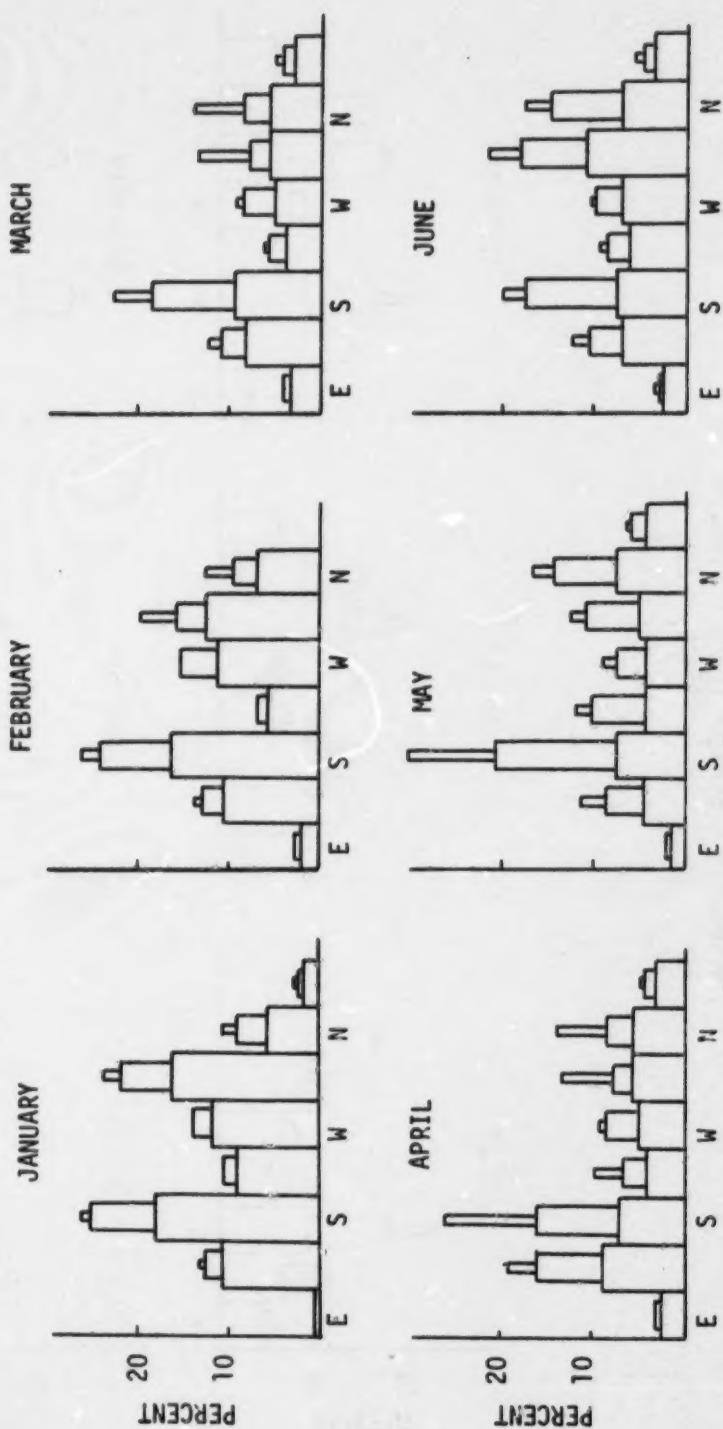


FIGURE VI-4 (Continued)
WIND DATA - BRIGHAM YOUNG UNIVERSITY
1953 - 1966

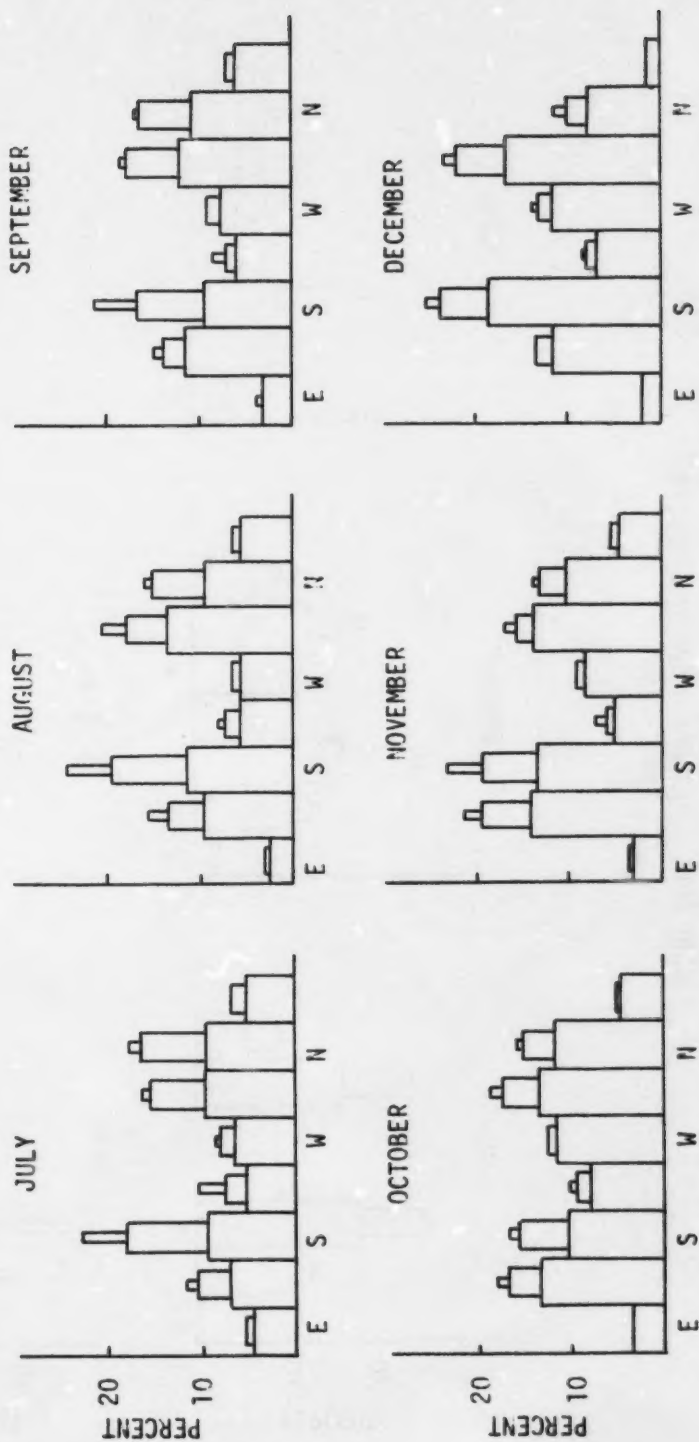
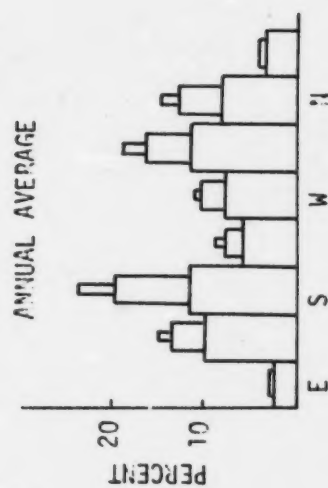


FIGURE VI-4 (Continued)
WIND DATA - BRIGHAM YOUNG UNIVERSITY
1953 - 1966

Key: Ordinate is percentage of time wind blows in given direction. Bottom, middle, and top segments refer to wind speeds between 0-2, 2-4, and >4 knots. Abscissa gives direction from which the wind blows.



Average Wind Speeds (knots)

<u>North</u>			
January	2.2	July	3.4
February	2.6	August	3.2
March	4.0	September	2.6
April	4.8	October	2.2
May	4.4	November	2.6
June	3.6	December	2.0
Year		3.1	

TABLE VI-4

ESTIMATED ANNUAL EMISSIONS
OF CARBON MONOXIDE AND TOTAL SUSPENDED PARTICULATES
IN STUDY AREA

<u>Source</u>	<u>Pollutant</u>	<u>Emissions (tons/year)</u>	
		<u>1974</u>	<u>1995</u>
Point	Carbon Monoxide	26,443	26,192
	Total Suspended Particulates	33,962	33,975
Line	Carbon Monoxide	430,162	102,631
	Total Suspended Particulates	18,672	22,231
Area	Carbon Monoxide	23,432	8,733
	Total Suspended Particulates	18,767	24,730
Total	Carbon Monoxide	480,037	137,556
	Total Suspended Particulates	71,401	80,936

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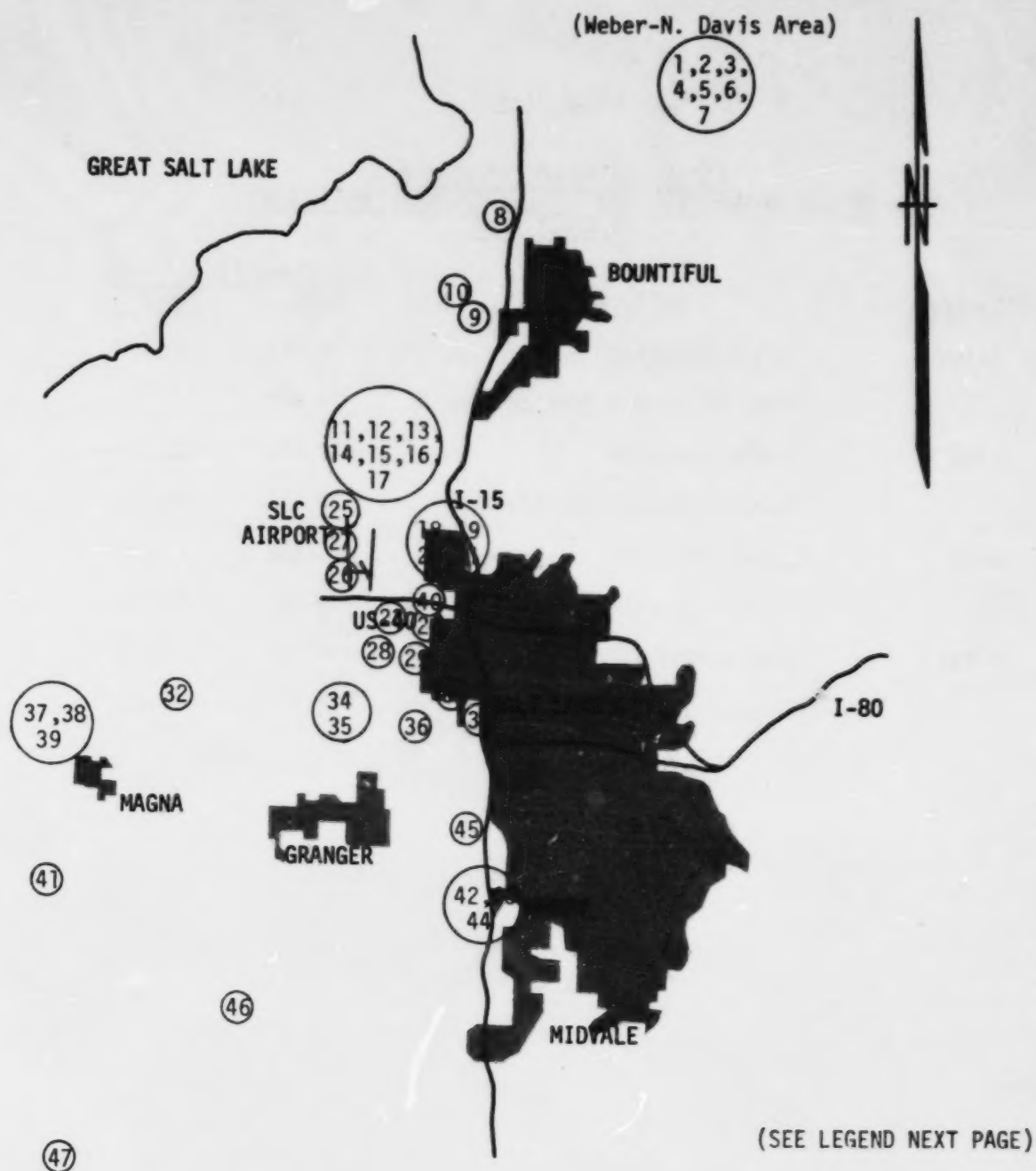


FIGURE VI-5
POINT SOURCES IN SALT LAKE CITY AIR BASIN

FIGURE VI-5 (Continued)

POINT SOURCES IN SALT LAKE CITY AIR BASIN

LEGEND:

1	Interpace	25-27	SLC Airport
2	Weber Co. Corp.	28	AMCOR SLC
3	Clearfield Steam Co.	29	MS Lime
4	Hill AFB	30	Utah University
5	Ideal Ready-Mix (Lay)	31	LDS Welf.
6	Parson Ready-Mix	32	Gibbons Concrete
7	Ideal Ready-Mix (Og.)	33	Portland Cement
8	Syro Steel	34	Filtrol
9	Phillips Ref.	35	Osteler
10	Davis Ready-Mix	36	EIMCO Foundry
11-13	Husky Ref.	37-39	Kennecott
14-16	Chevron Ref.	40	May Foundry
17	Monroe (Beck St.)	41	Hercules
18	Utah S&G	42	Brookfield Prod.
19	Gardner Asph.	43	Monroe (Murray)
20-21	Amoco Ref.	44	Kiewit
22	LDS Hospital	45	Wasatch Mt.
23	NL Ind.	46	Monroe (62S)
24	UPL NSLPP	47	Proler

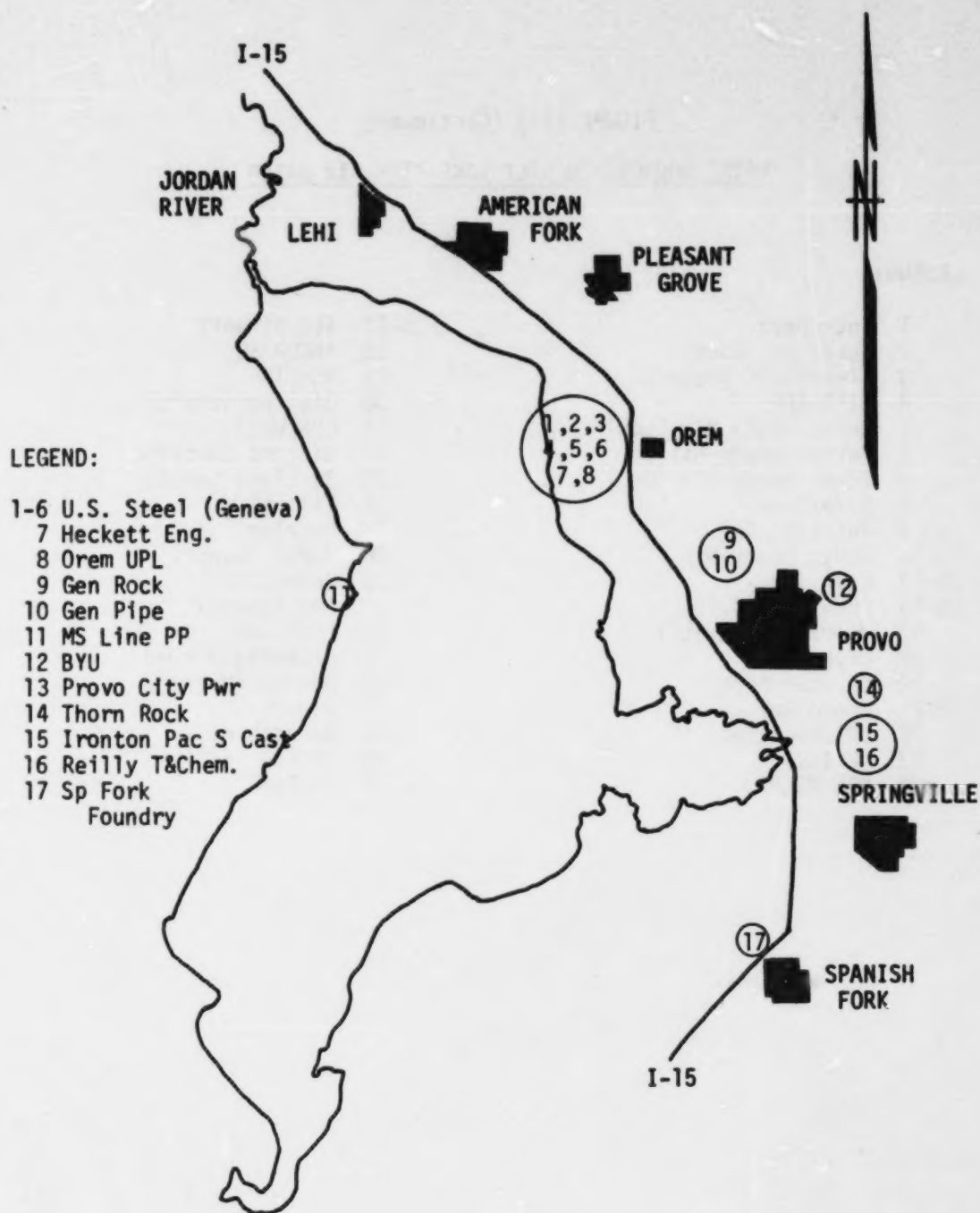


FIGURE VI-6
POINT SOURCES IN THE PROVO AIR BASIN

- B. Line sources. The line source inventory for the future (1995) time period was furnished by the Utah State Department of Highways. These data were developed as part of the SLATS (143), UVATS (144), and OATS (145) studies. Annual average data from these studies were directly applicable; but some data extrapolation was necessary for the short-term case. Methodology and results of the extrapolation were coordinated with the Highway Department's planners. Line source inventory for the present (1974) time period was also obtained from the Utah State Department of Highways (153, 154). Line source emission estimates for CO were based on the type of automotive vehicle, the year, the recommended vehicle mix, cold starts, Utah's altitude and temperatures, and the range of average driving speeds. Estimating procedures followed EPA guidelines (155) for calculating automotive emission factors. Vehicle emission factors for 1975 and 1995, assuming an annual average temperature of 51°F., are presented in Table VI-5.
- C. Area sources. Area source emissions were based upon the projected distributions of population and employment, and upon Utah data regarding fuel consumption. The basic area source input data for the air quality model are presented in Volume B-1000, "Air Quality Modelling," of the Study Task Report Series. For the Salt Lake City air basin, 187 area sources were employed, while the Provo air basin was divided into 48 area sources. Available SIP provisions do not specify reductions in particulate emissions for each individual source. There is evidence of recent reductions in emissions from some sources, but no basis for projecting additional changes resulting from implementation of the SIP.

As the study progressed, it became evident that carbon-monoxide emissions and concentrations can be expected to decrease significantly between 1974 and 1995. Because both one-hour and eight-hour CO standards were exceeded over much of the Study Area in 1974, the rate of reduction in emissions between 1974 and 1995 became a matter of concern. Although it was not possible to assemble a complete emission inventory and perform model runs for the interim time period, it was decided to perform a brief analysis of the expected situation for the year 1985. The 1985 interpolation was restricted primarily to carbon monoxide because, based upon available data, particulate concentrations will not change significantly between 1974 and 1995.

The following process was used to estimate emissions for the one-hour maximum carbon monoxide concentration in 1985. A median population and employment distribution (arithmetic average of the population and employment for 1974 and 1995) was assumed. The meteorological conditions were those used for computing the one-hour maximum concentrations for 1974 and 1995. Linear interpolation was used for point source emissions, which are expected to remain almost constant over the period 1974-1995.

Speeds for various road elements in 1974 were determined from Utah Highway Department data. They were assumed to be the same for 1985.

TABLE VI-5

COMPOSITE LINE SOURCE EMISSION FACTORS FOR CARBON
MONOXIDE (CO) IN GRAMS/MILE

<u>Speed</u> <u>(MPH)</u>	<u>Calendar</u> <u>Year 1975</u>	<u>Calendar</u> <u>Year 1995</u>
10	211	21
15	146	15
17	137	14
18	132	13
19	127	12
20	123	12
21	119	11
22	116	11
23	112	11
24	109	11
25	106	10
26	103	10
27	101	10
31	92	9
32	90	8
34	87	8
35	86	7
36	84	7
37	83	7
38	81	7
40	80	7
43	77	7

From these data, the percent of total vehicle miles (TVM) driven at each speed was assumed to be the same in 1985. An annual growth rate of 4 percent through 1980, and an annual growth rate of 2 percent thereafter, was used. This growth rate was applied to 1974 TVM per day to extrapolate to the 1985 TVM. The same growth rates were applied to the 1995 TVM to reduce TVM per day in 1995 to that in 1985. These two values were then averaged to obtain the TVM per day in 1985. The TVM per day in 1985 at each speed was obtained by multiplying the total TVM per day in 1985 by the fractional TVM per day at each speed. The emissions in grams/mile were determined for the two "worst" days listed in Table VI-3 by applying the same method used in calculating the 1974 and 1995 emissions. The resultant CO emission factors are presented in Table VI-6.

The TVM per day and emissions in grams/mile for each speed were used to determine the emissions in grams/second.

A summary of the resulting CO emission is presented in Table VI-7. The area-source emissions include emissions from off-highway automotive traffic, in addition to emissions from space heating. The percentage reduction in the Provo air basin is greater than that predicted for the Salt Lake City air basin. The difference in percentages arises primarily from difference in temperature during the "worst case" one hour period in Salt Lake City and Provo. On an annual-average basis, the percentage reductions for the two basins would be similar, and would approximate those shown for the one-hour case in Provo.

It was assumed that for each type of source (i.e., point, area, and line) concentrations would be proportional to emissions. For each source the ratios of emissions in 1985 to those in 1974 were determined and multiplied into the concentrations at all receptor points for 1974. The ratios of the emissions for 1985 to those in 1995 were also determined and multiplied into the concentrations in 1995 at every receptor point. The concentrations at each receptor formed in both ways were averaged. This gave the final values of one-hour maximum average concentrations at every receptor point in each air basin for 1985.

MODEL VERIFICATION

Although CO and TSP data exist for some or all of the 13 air quality monitoring stations in the Study Area, the availability of line, point, and area source emission inventories for only the urban areas precluded using data from all 13 stations for verification of the model. As a result data from only the Salt Lake City, Salt Lake City Airport, Bountiful, Orem, Geneva, and Provo monitoring stations were used.

The base meteorologic and source data previously discussed was used to model the "worst day" conditions of December 2, 1974 in the Salt Lake City basin and November 12, 1974 in the Provo basin. A comparison of monitored values and calculated data for the maximum 1-hour and 8-hour CO concentrations as well as the 24-hour and annual average TSP concentrations is presented in Table VI-8.

In comparing the modelled CO values with the monitored CO values presented in Table VI-8, relatively good agreement is apparent. The maximum differences occur at the Salt Lake City monitoring site where the model produced maximum 1-hour and 8-hour CO estimates 20 percent higher than observed values. Estimated values at the Bountiful and Provo monitoring sites were only 7 and 13 percent higher than observed

TABLE VI-6

AUTOMOTIVE CO EMISSION FACTORS
FOR 1985 IN GRAMS/MILE

<u>Speed in mph</u>	<u>Salt Lake City Basin December 2, 1974 (24°F)</u>	<u>Provo Basin November 12, 1974 (50°F)</u>	<u>Both Basins Annual Average Temperature (51°F)</u>
10	106	52	50
15	72	34	33
17	67	32	30
18	64	31	29
19	62	30	29
20	60	29	28
21	59	28	27
22	56	27	26
23	55	26	25
24	53	25	24
25	52	25	24
26	51	24	23
27	49	23	22
31	45	21	20
32	44	21	20
34	42	20	19
35	41	19	19
36	41	19	18
37	40	19	18
38	39	18	17
40	38	17	16
43	36	17	16

TABLE VI-7

TREND IN MAXIMUM ONE-HOUR CARBON MONOXIDE EMISSIONS
(WORST-CASE CONDITIONS)

Air Basin	Type of Source	Emissions (grams/second)		Percent Change
		1974	1985	
Salt Lake City	Line	17,070	8,010	-53
	Point	400	395	-1
	Area	2,110	1,015	-52
	Total	19,580	9,420	-52
Provo	Line	4,645	1,290	-72
	Point	535	535	0
	Area	565	165	-71
	Total	5,745	1,990	-65

TABLE VI-8

COMPARISON OF CALCULATED WITH MONITORED DATA FOR 1974

Monitoring Station	Carbon Monoxide Comparison (ppm)				Particulate Matter Comparison (ug/m ³)			
	Maximum 1-Hour Concentration		Maximum 8-Hour Concentration		24-Hour Concentration		Annual Average	
	Monitor	Model	Monitor	Model	Monitor	Model	Monitor	Model
Salt Lake City ¹	36	43.3	16.0	19.2	212	257	83	255
Salt Lake City Airport ¹	-	-	-	-	183	147	76	102
Bountiful ¹	23	21.4	9.25	8.57	107	91	49	74
Orem ²	-	-	-	-	Unavail.	79	65	81
Geneva ²	-	-	-	-	128	53	64	53
Provo ²	30	26.1	16.1	14.0	122	132	78	74

Particulate concentrations include an assumed "background" of 20 micrograms per cubic meter, in accordance with Reference 141.

NOTES:

1. Data for December 2, 1974.
2. Data for November 12, 1974.

concentrations of CO. No further comparison of modelled and monitored CO values was made because of the limited number of stations (three) involved.

Because a comparison of calculated and monitored TSP values could be made at six sampling locations, a regression-type analysis was made on this data base. The results of this analysis are illustrated in Figures VI-7 and VI-8 for the 24-hour and average annual TSP concentrations, respectively. The results include monitoring sites in both basins and include a 20 ug/m^3 background TSP concentration for estimated values. Because the intercepts of the equations of "best fit" are not zero and the correlation coefficient for the average annual TSP values is only 0.60, some statistical unreliability is apparent. Additionally, positive intercepts could imply that background TSP concentrations in the Study Area may be greater than 20 ug/m^3 . However, in general the "best fit" lines in Figures VI-7 and VI-8 reflect a relatively good comparison between monitored and calculated TSP concentrations.

Although models such as UTAIR tend to predict concentrations rather accurately over a number of sample points in a statistical sense, predicted values at a single sample point often differ significantly from observed readings. For example, in Table VI-8 a predicted annual average of 255 micrograms per cubic meter (ug/m^3) for particulates at the downtown monitoring station, is compared with a monitored value of 83 ug/m^3 . Possible causes of the difference include:

1. The model predicts ground level concentrations, whereas the Salt Lake City station is located about 35 feet above ground level (142). Because only about 3 percent of the predicted ambient concentration originates from point sources, and because there is a heavy concentration of essentially ground-level line and area source emissions in the immediate vicinity of the station, predicted concentrations at ground level are likely to be significantly higher than for a receptor height of 35 feet.
2. The meteorological data used by the model were accumulated at the Salt Lake Airport, which is located in relatively open terrain, whereas the downtown Salt Lake City station is unique in that it is located in the heart of a metropolitan area, and has a combination of thermally induced wind circulations, such as the mountain valley, heat island and lake breeze circulations (147). Differences in atmospheric data between the two sites might have a significant effect upon the predicted concentrations.
3. Local microscale conditions (e.g., adjacent parking lots, obstructions, ventilators, wind currents), can have a significant impact upon monitored readings, as can calibration practices and the inherent mean percentage errors of the monitoring equipment.

Thus, in order to resolve discrepancies between monitored data and model predictions, it is necessary to perform an objective evaluation of the model, the inventory, and the monitoring station. In the present

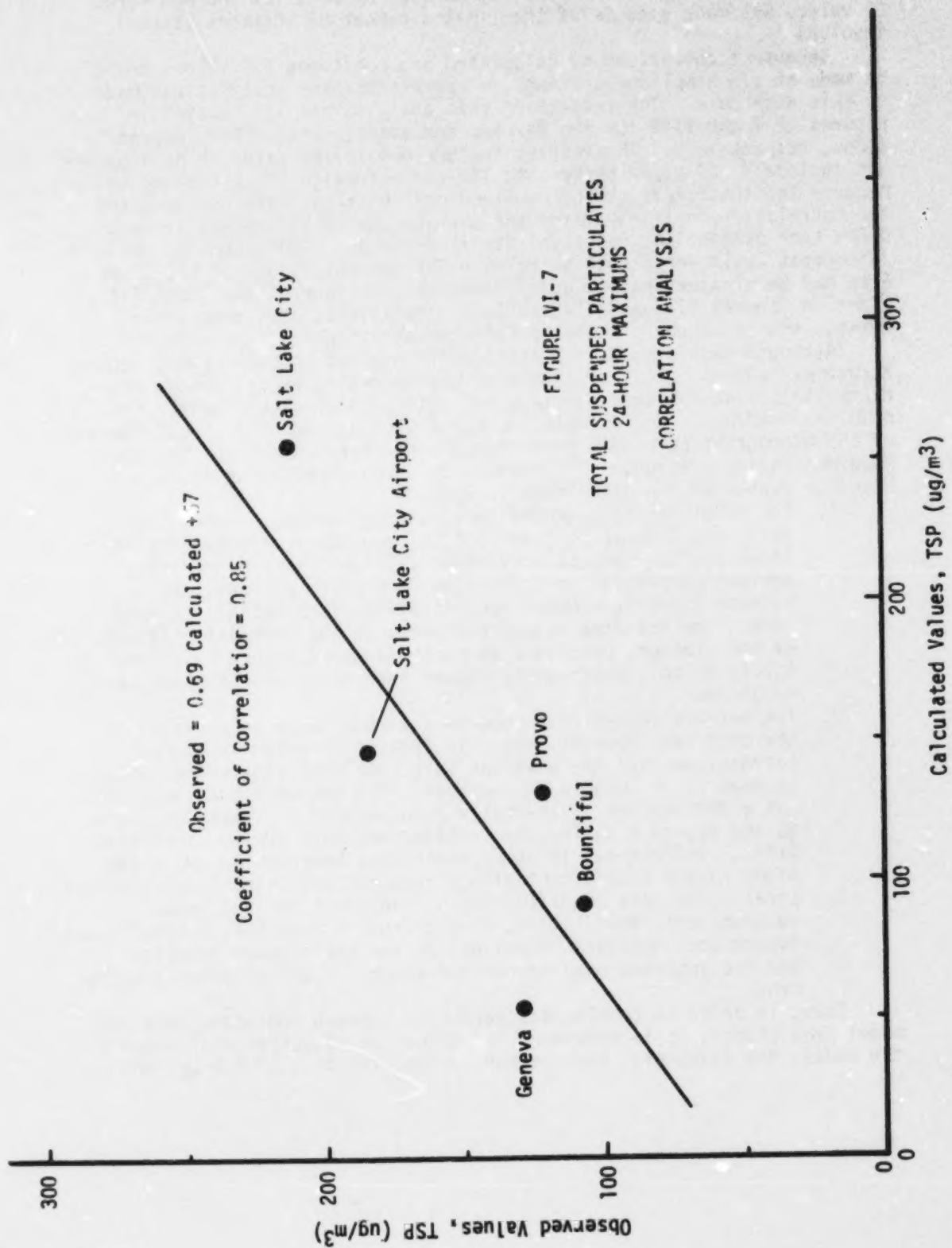
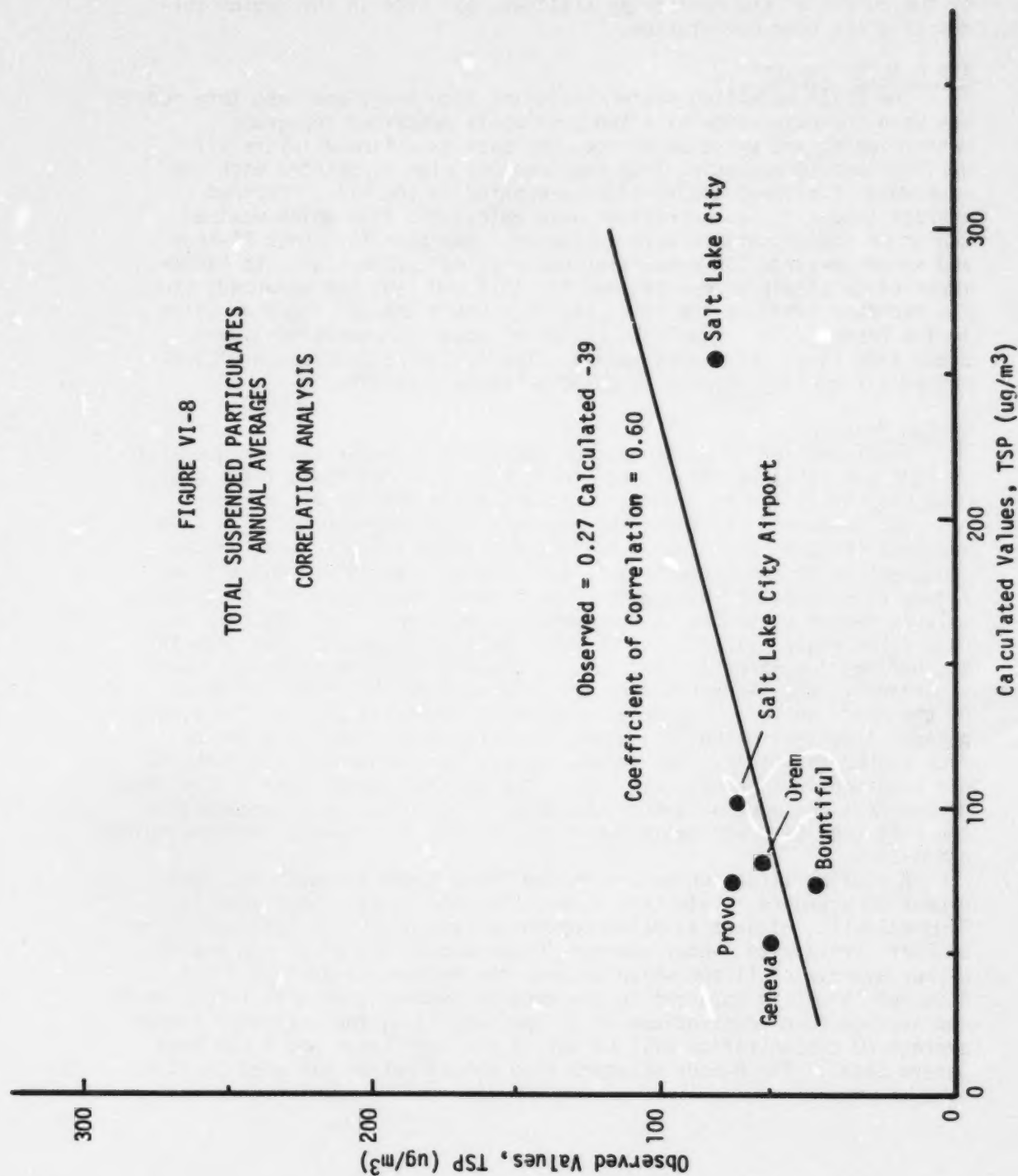


FIGURE VI-8
TOTAL SUSPENDED PARTICULATES
ANNUAL AVERAGES
CORRELATION ANALYSIS



instance, it is possible to state only that the model's results, as presented in Table VI-8, appear to be in reasonable agreement with most of the output of the monitoring stations, but high in the region surrounding the downtown station.

AIR QUALITY IMPACTS

The UTAIR modelling system including both short and long term modes was used in conjunction with the previously described topographic, meteorologic, and emission source data base to estimate future air quality impacts resulting from the land use plan associated with the wastewater treatment alternatives presented in the Plan. Maximum average 1-hour CO concentrations were calculated from which maximum 8-hour CO concentrations were estimated. Additionally, both 24-hour and annual average TSP concentrations were calculated for both basins. These calculations were performed for 1974 and 1995 and were made at 226 receptor sites in the Salt Lake City basin and 327 receptor sites in the Provo basin. Isopleths (lines of equal concentration) were drawn from these calculated values. The following discussion of perceived air quality impacts is based on these isopleths.

Carbon Monoxide

Isopleths for CO concentration for one and 8-hour maximum averages in 1974 and 1995 are illustrated in Figures VI-9 and VI-10 for the Salt Lake City basin and in Figures VI-11 and VI-12 for the Provo basin.

The 1-hour CO isopleths for the Salt Lake City air basin in 1974 and 1995 (Figures VI-9 and VI-10, respectively) reflect a marked improvement in CO concentrations in the future. The 1974 isopleths in Figure VI-9 indicate that, under "worst-case" meteorological conditions, a large region extending to the north and northwest from the Salt Lake City urban center exceeds the 35-ppm 1-hour CO standard. The wind in the defined "worst-case" condition is blowing from the south-southeast. Accordingly, the concentrations are displaced to the north-northwest of the major emission sources. Under some other set of conditions, the pollutant concentration in a given location (e.g., Murray) might be much higher than that shown in the Figure, but should not equal the 40 ppm obtained in Salt Lake City under the defined "worst case." For 1995, neither the one hour or 8-hour standard is estimated to be exceeded in the Salt Lake City air basin under the assumed "worst-case" meteorological conditions.

A similar situation exists in the Provo basin although only the 8-hour CO standard is violated under 1974 conditions illustrated in Figure IV-11. Highest existing concentrations of CO are manifested over southern Provo with 1-hour average CO concentrations of 25 ppm and an 8-hour average of 11 ppm which exceeds the 8-hour standard of 9 ppm. A second "high" is apparent in the area of Geneva Steel with 1-hour maximum average CO concentrations of 10 ppm. By 1995, the estimated 1-hour average CO concentration will be only 5 ppm over Provo and 1 ppm over Geneva Steel. The 8-hour standard also should not be exceeded in 1995.

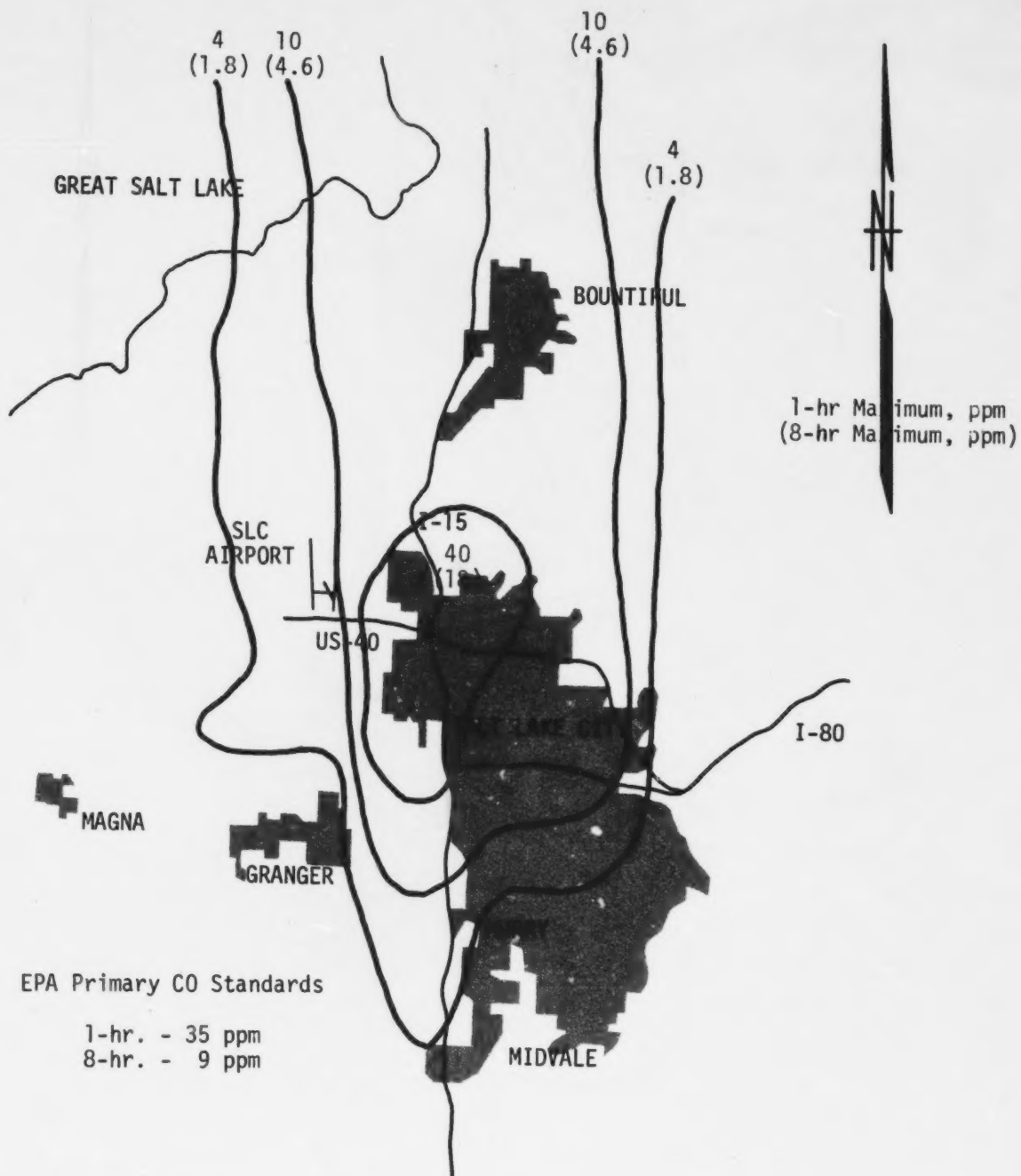


FIGURE VI-9
1974 CARBON MONOXIDE CONCENTRATION
SALT LAKE CITY AIR BASIN

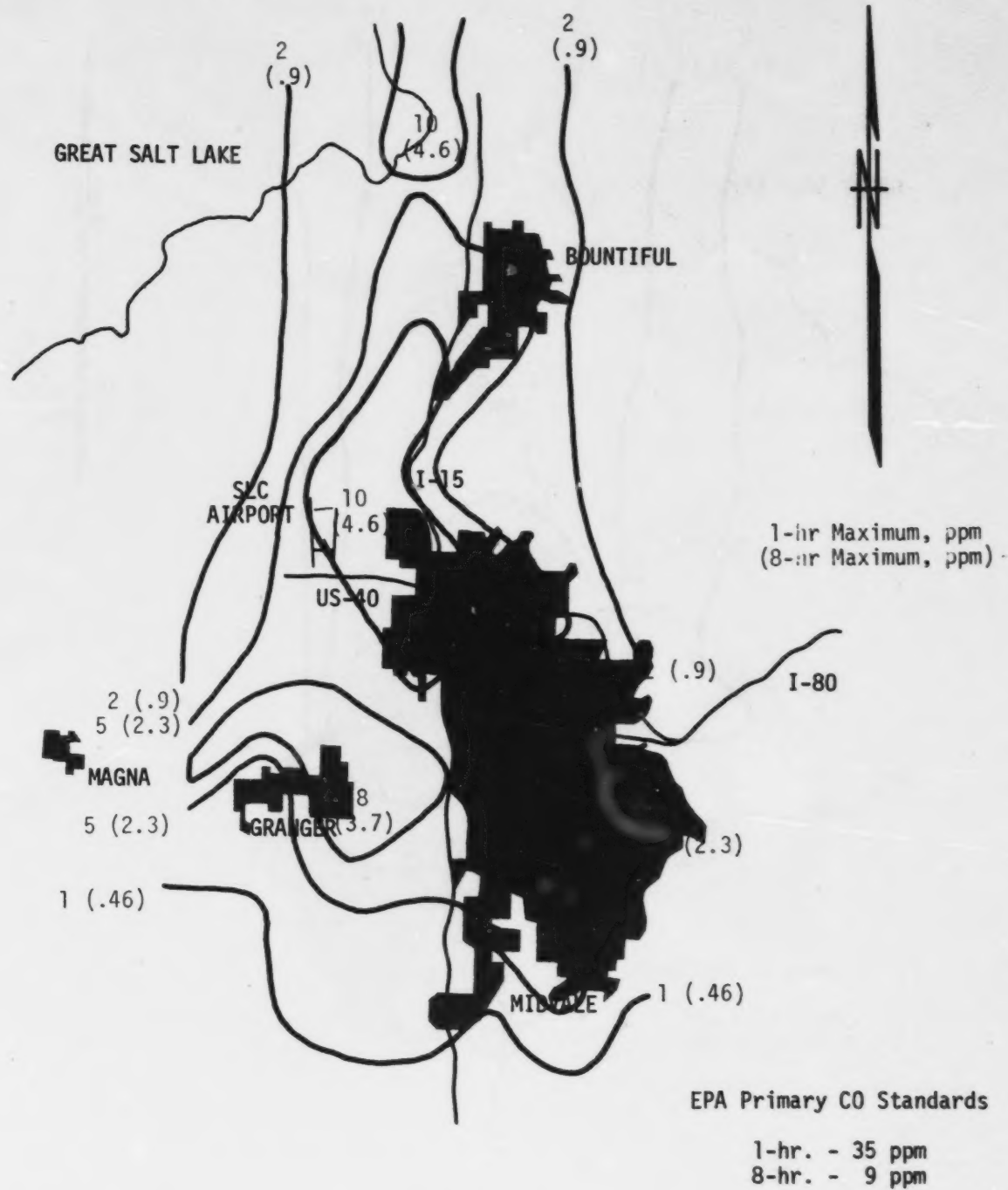


FIGURE VI-10
1995 CARBON MONOXIDE CONCENTRATION
SALT LAKE CITY AIR BASIN

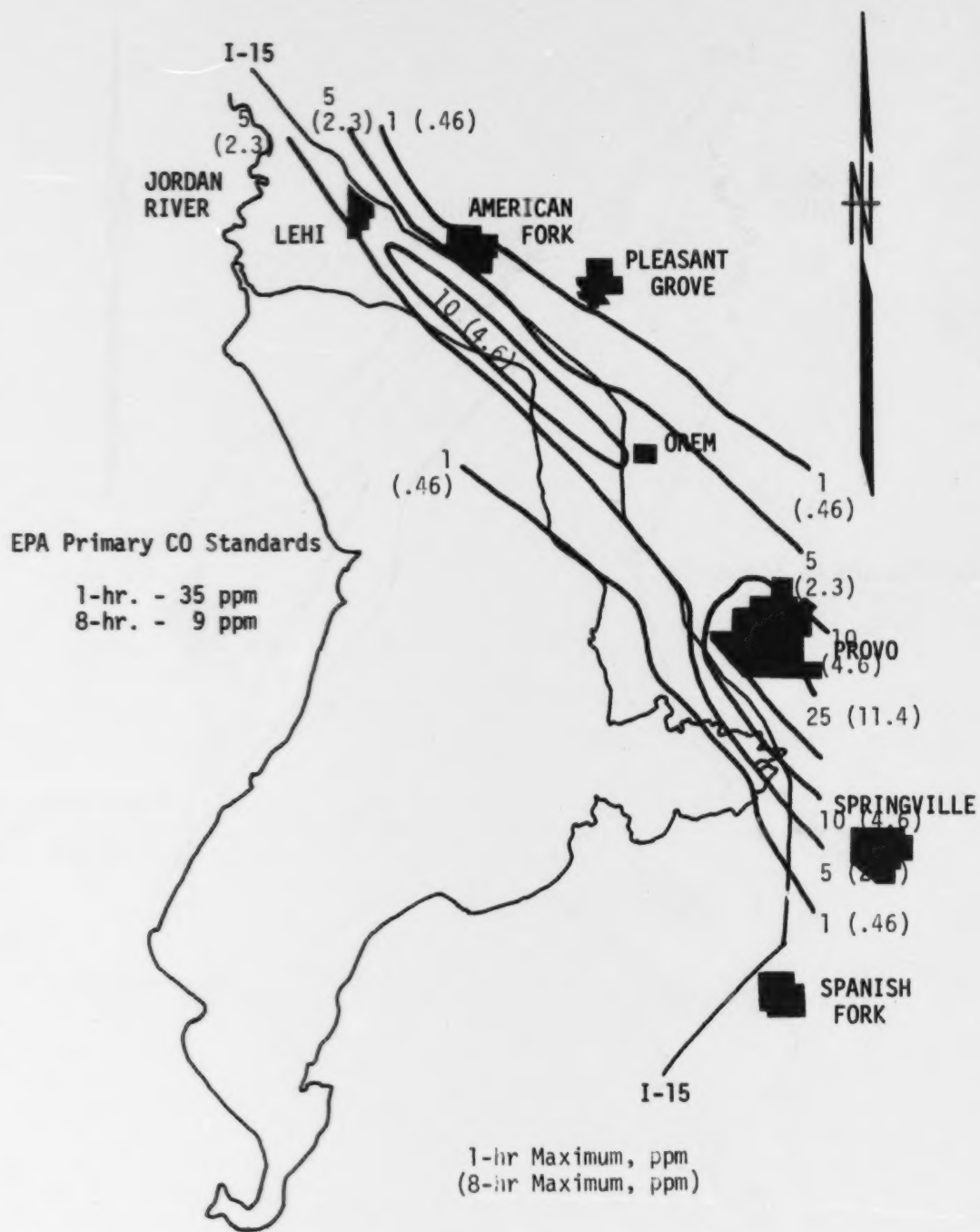


FIGURE VI-11
1974 CARBON MONOXIDE CONCENTRATION
PROVO AIR BASIN

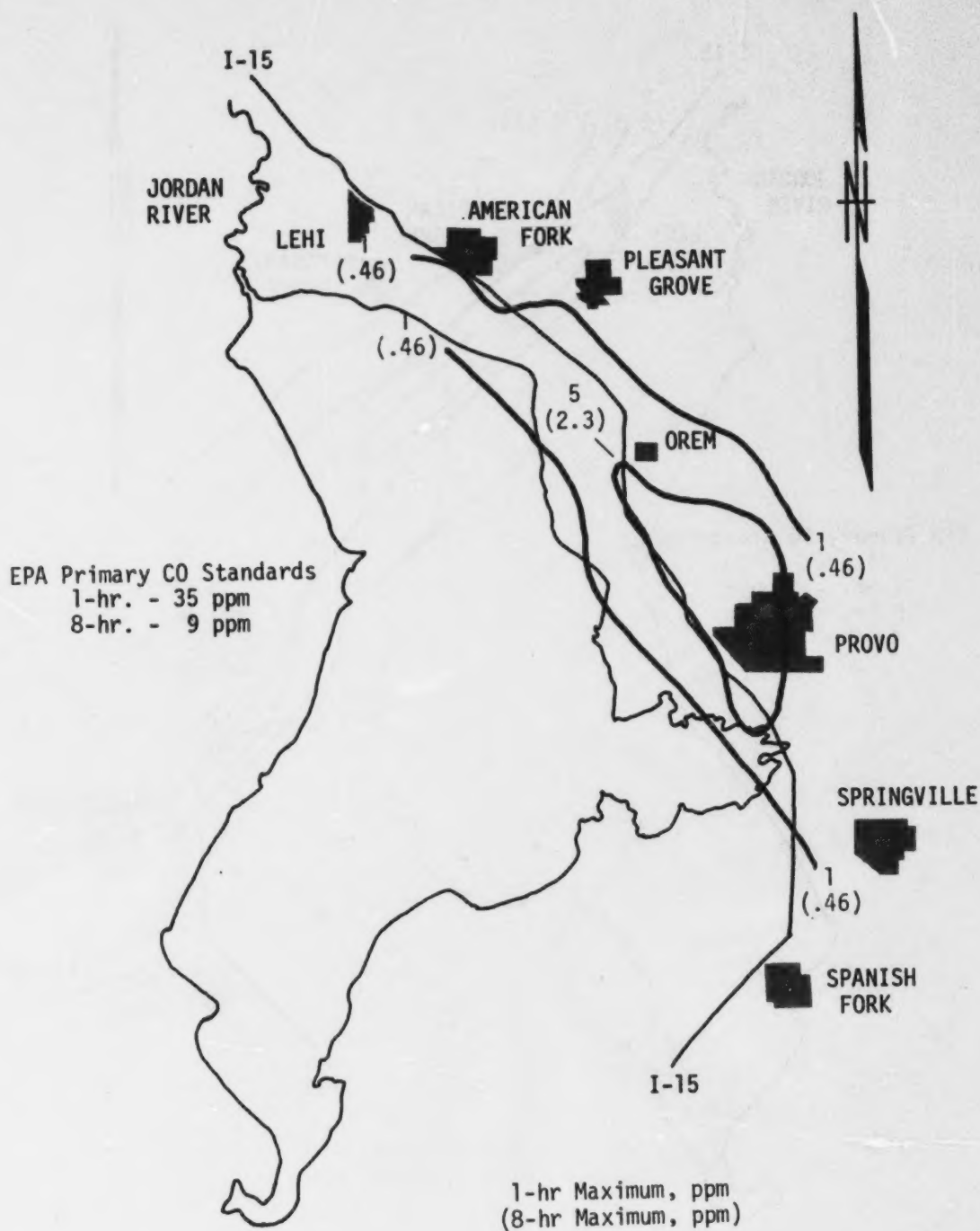


FIGURE VI-12
 1995 CARBON MONOXIDE CONCENTRATION
 PROVO AIR BASIN

These significant reductions in CO concentrations over the Study Area by 1995 in spite of increased development are primarily the result of reductions in line source emissions through automobile exhaust controls.

In order to obtain an estimate of the expected rate of change in carbon monoxide concentrations in the Study Area, CO emissions for the year 1985 were obtained. Dispersion model runs were not made for 1985, but concentrations were estimated using the technique discussed earlier. The resulting isopleths are presented in Figures VI-13 and VI-14.

The isopleths indicate that in 1985 carbon monoxide concentrations over a central region in the Salt Lake City air basin may exceed the 1-hour standard and over a larger area the 8-hour standard may be exceeded. Violation of the 8-hour standard is more likely than is violation of the 1-hour standard. Because of the procedure employed in obtaining the isopleths, and because of the small margin by which standards apparently will be exceeded, additional study should be required before a definitive conclusion is reached.

The isopleths for the Provo air basin indicate that CO concentrations can be expected to be within standards by 1985. Concentrations are significantly lower than standards over the region.

Total Suspended Particulates

Isopleths for total suspended particulates (TSP) in both basins for the 24-hour and annual averages for 1974 and 1995 are shown in Figures VI-15 through VI-22. The 24-hour TSP concentration of 260 $\mu\text{g}/\text{m}^3$ (Figure VI-15) is apparently violated in 1974 in western Salt Lake City where concentrations are estimated to reach 280 $\mu\text{g}/\text{m}^3$ under the assumed "worst case." The 1974 estimated annual average values, Figure VI-16, indicate that the 1-year average standard of 75 $\mu\text{g}/\text{m}^3$ is exceeded over the same general area.

As shown in Figures VI-17 and VI-18, the general pattern for particulate concentrations in the Salt Lake City air basin is expected to continue through 1995. There appears to be a tendency for the contours to move radially outward near the periphery, with attendant decrease in levels near the heart of the metropolitan area. To some extent this would be expected - as the urban area expands and becomes more decentralized, the air in outlying areas tends to become more polluted. The isopleths tend to follow growth and development patterns, modified in this instance by the direction of the prevailing winds, which tend to distort the contours in a north-northwest direction.

The 1974 estimated TSP concentrations for the Provo basin illustrated in Figures VI-19 and VI-20 indicate 24-hour TSP concentrations less than 100 $\mu\text{g}/\text{m}^3$, well below the primary standard of 260 $\mu\text{g}/\text{m}^3$, but annual average TSP concentrations of 80 $\mu\text{g}/\text{m}^3$, slightly above the primary standard of 75 $\mu\text{g}/\text{m}^3$.

As illustrated in Figure VI-21, the 1995 24-hour TSP concentration pattern in the Provo basin is not expected to change much from that in 1974. The 1995 annual average TSP concentration will decrease slightly to just within the primary standard of 75 $\mu\text{g}/\text{m}^3$ but will still be in violation of the secondary standard of 60 $\mu\text{g}/\text{m}^3$ over northwestern Provo.

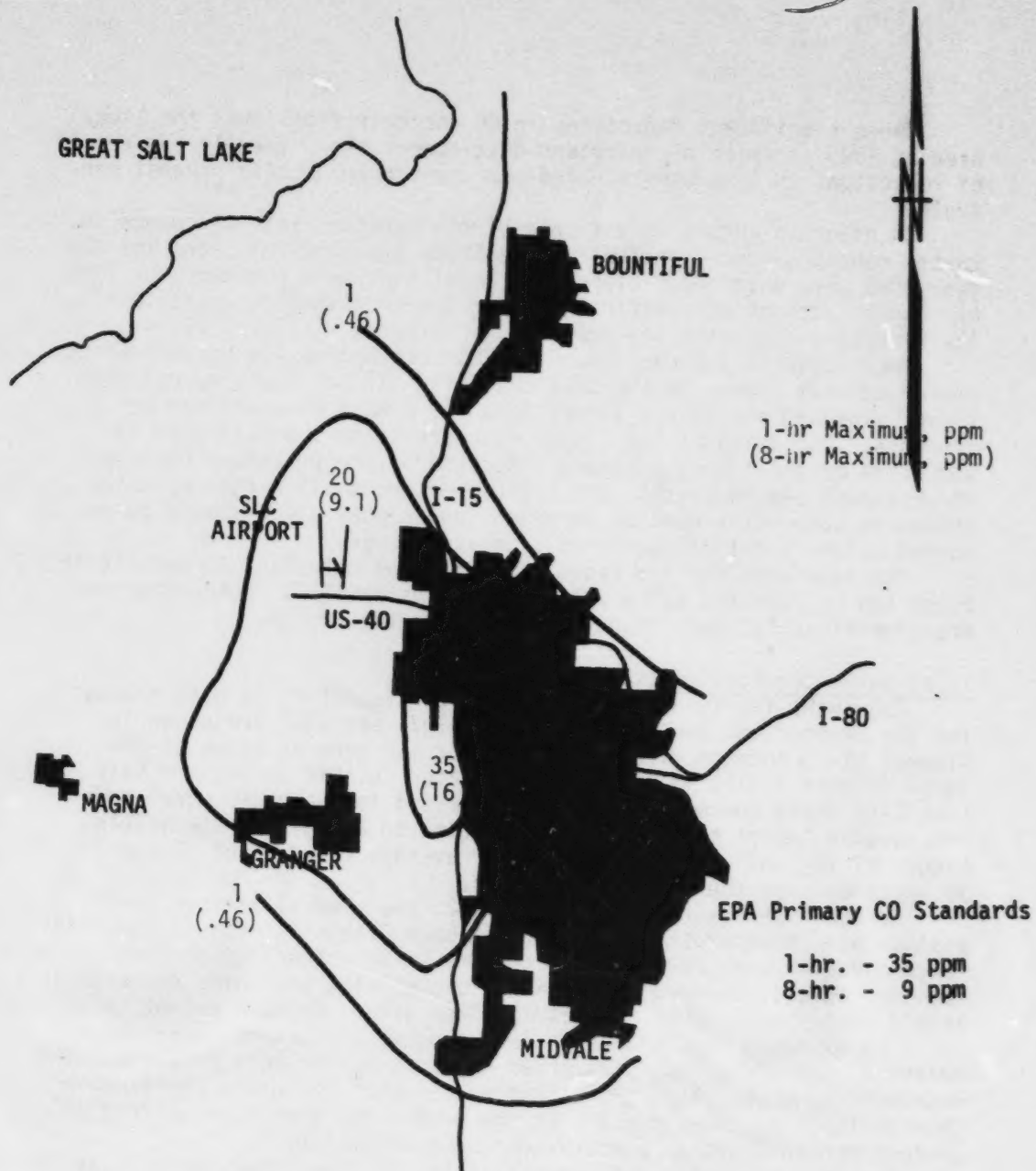


FIGURE VI-13
1985 CARBON MONOXIDE CONCENTRATION
SALT LAKE CITY AIR BASIN

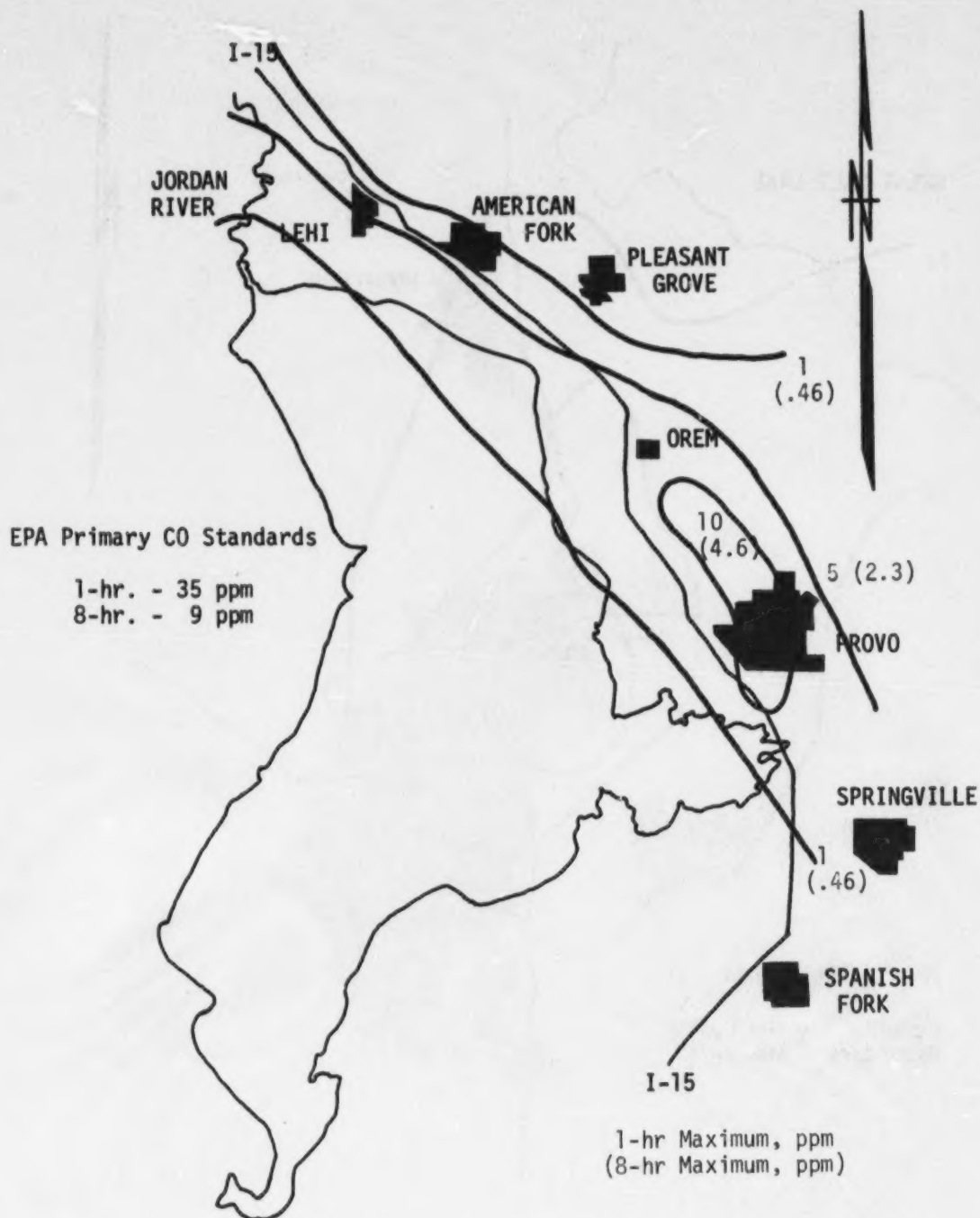


FIGURE VI-14
1985 CARBON MONOXIDE CONCENTRATION
PROVO AIR BASIN

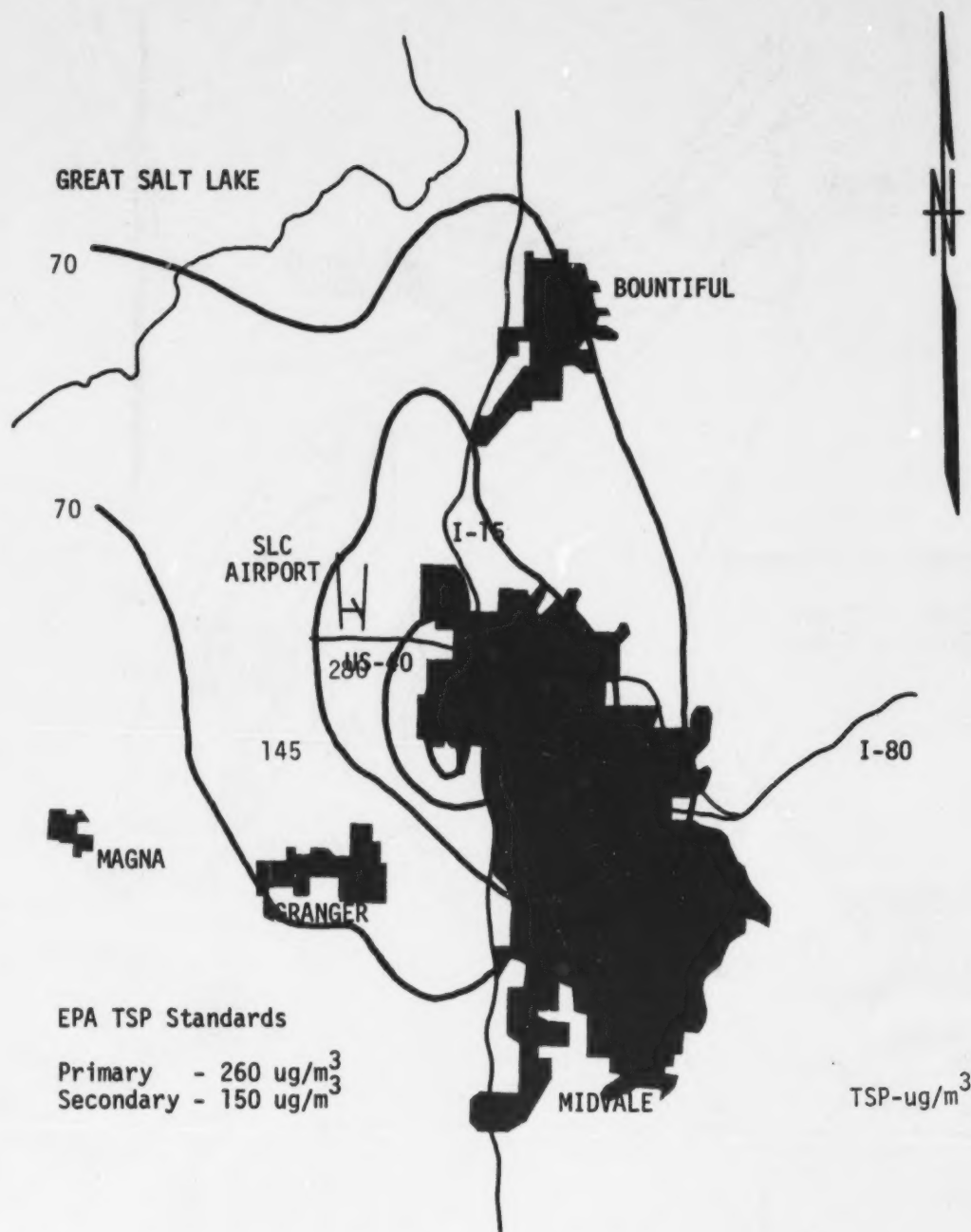


FIGURE VI-15
24-HOUR MAXIMUM PARTICULATE CONCENTRATION
SALT LAKE CITY 1974

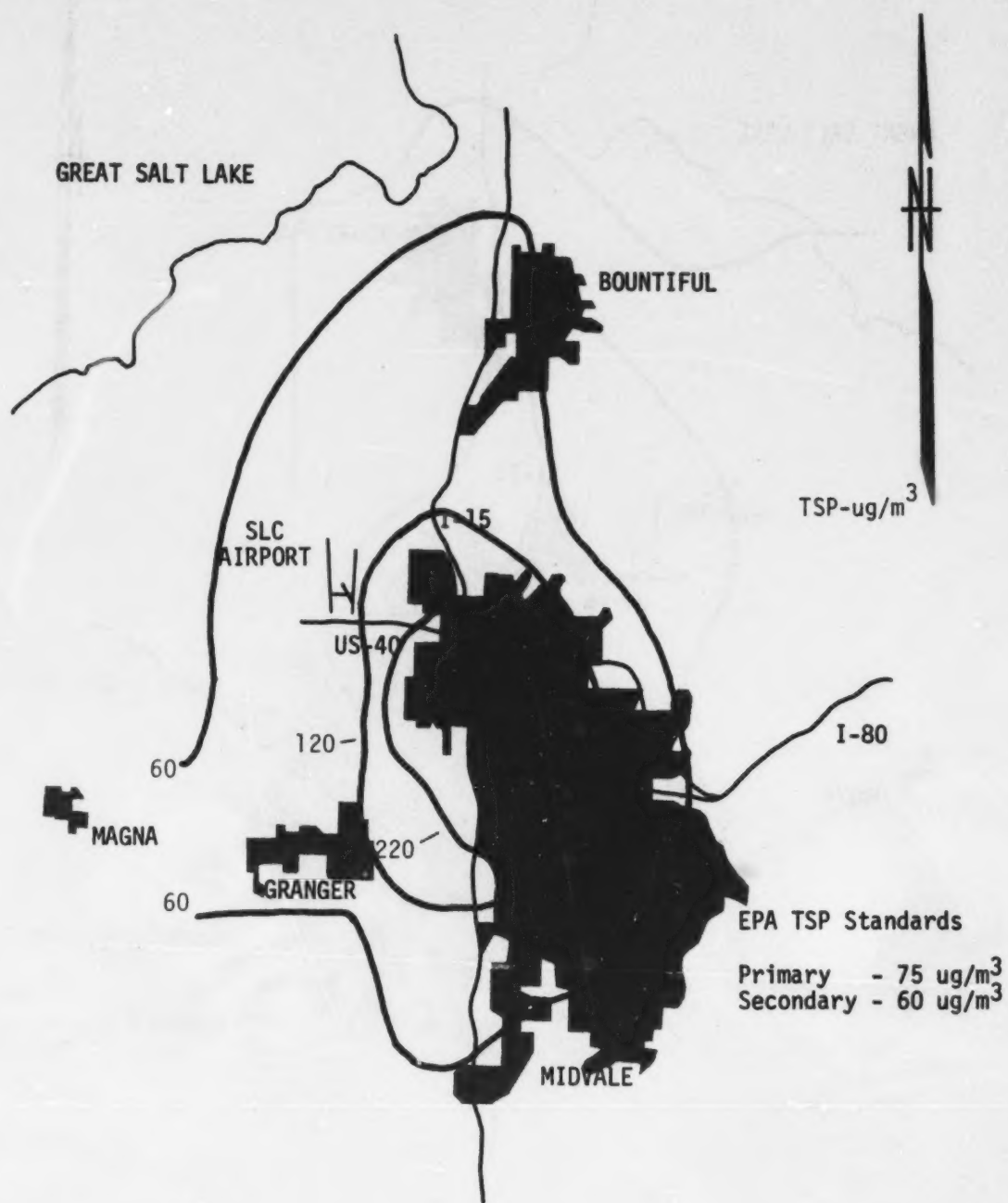


FIGURE VI-16
ANNUAL AVERAGE PARTICULATE CONCENTRATION
SALT LAKE CITY 1974

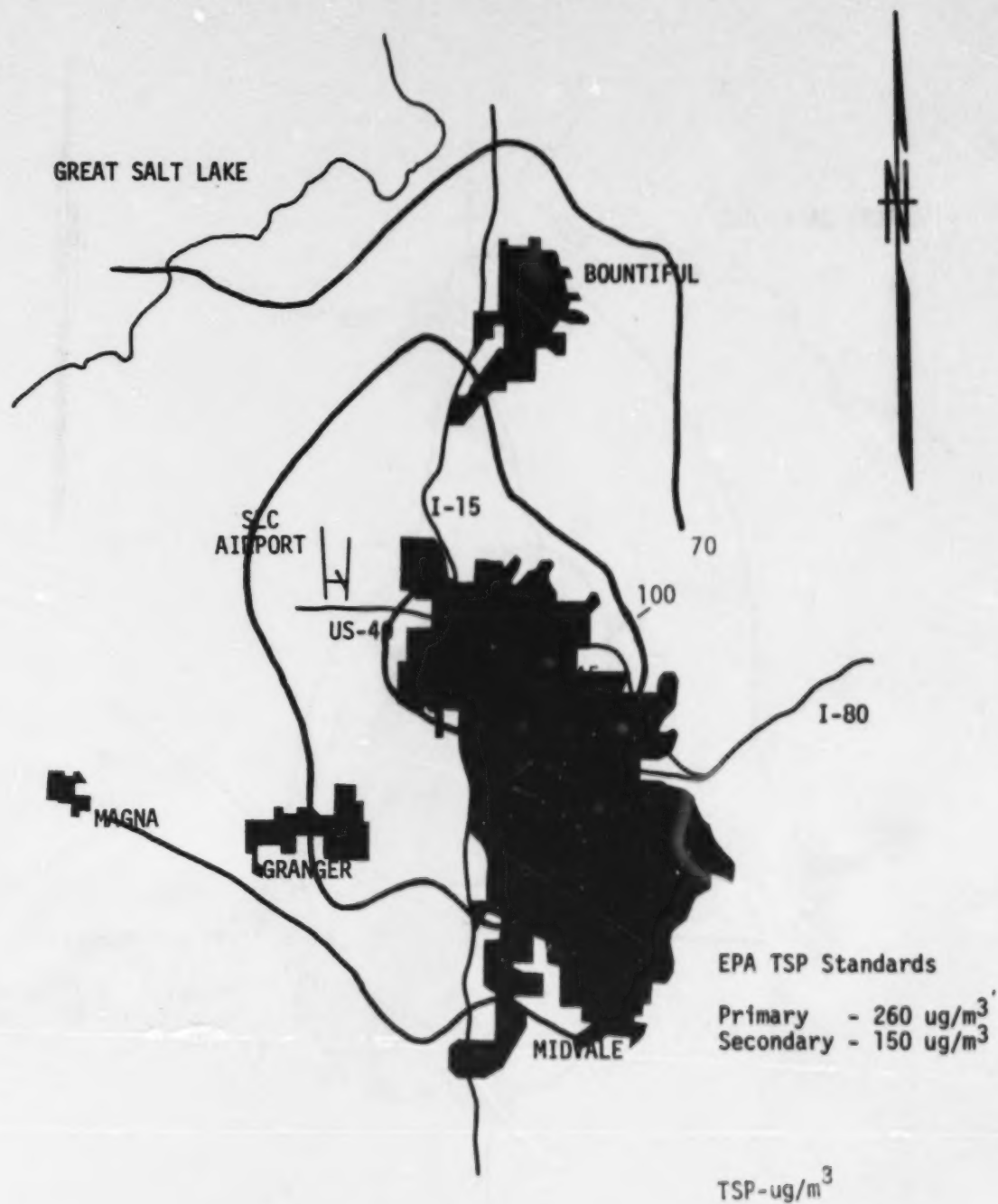


FIGURE VI-17
24-HOUR MAXIMUM PARTICULATE CONCENTRATION
SALT LAKE CITY 1995

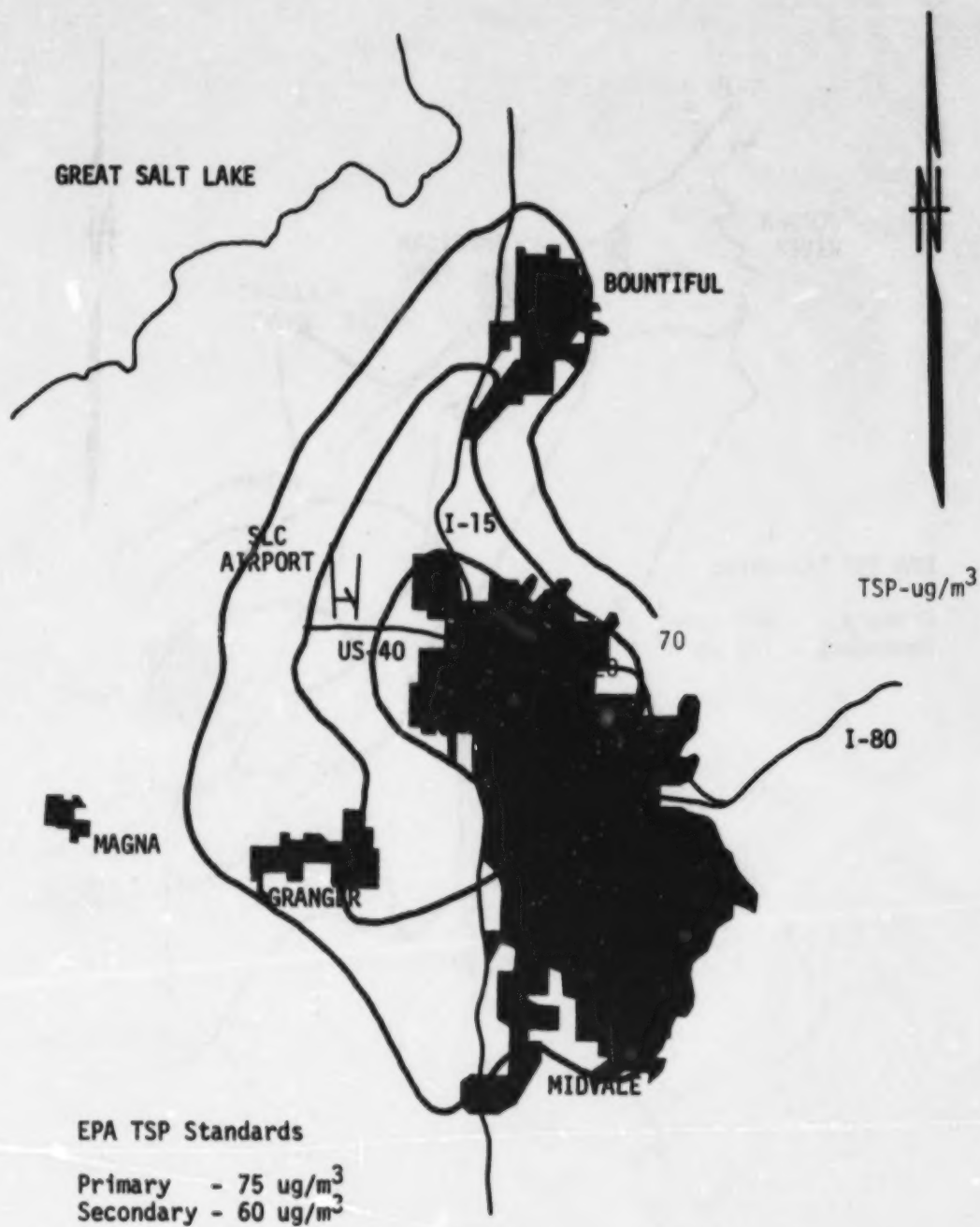


FIGURE VI-18
ANNUAL AVERAGE PARTICULATE CONCENTRATION
SALT LAKE CITY 1995

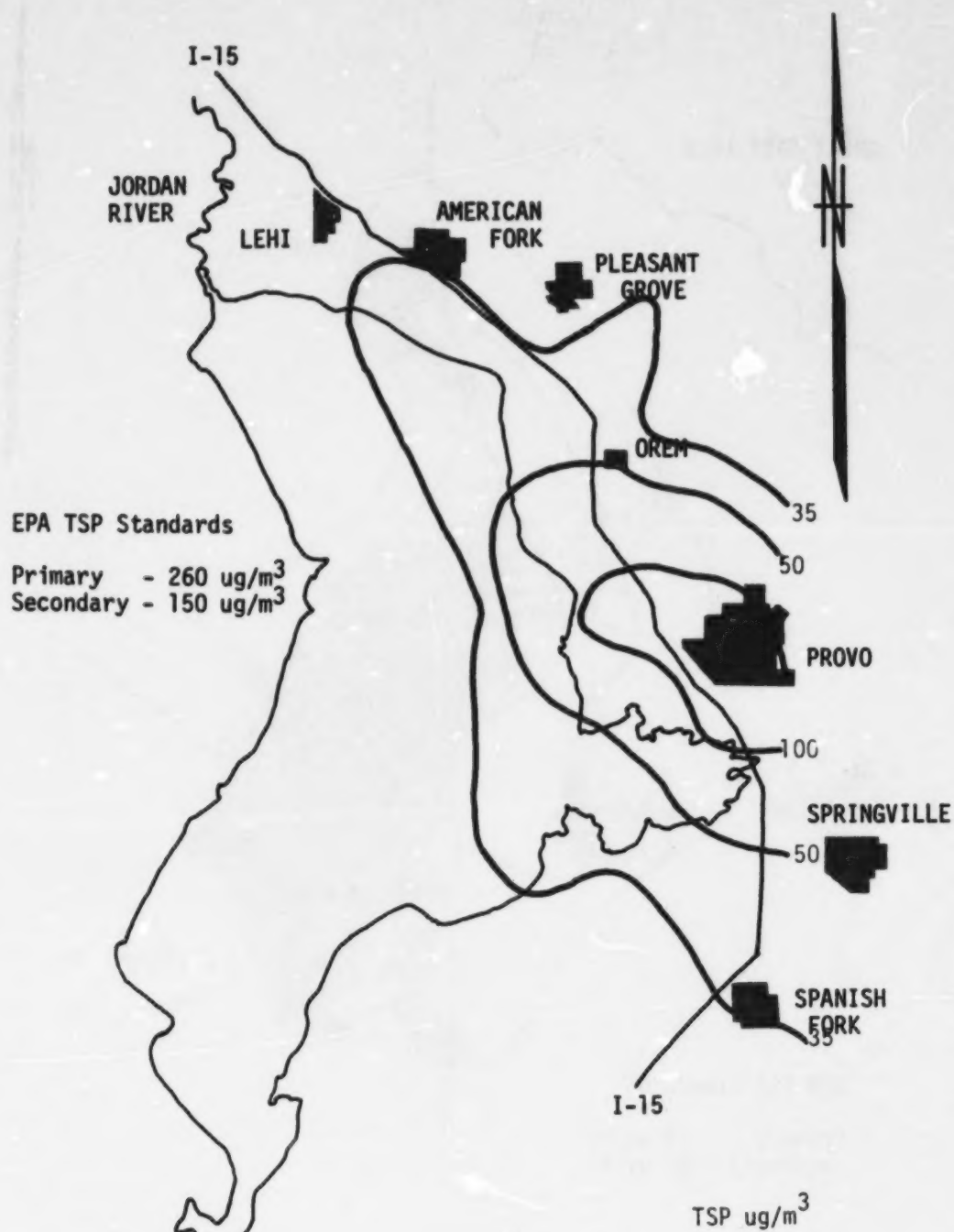


FIGURE VI-19
24-HOUR MAXIMUM PARTICULATE CONCENTRATION
PROVO 1974

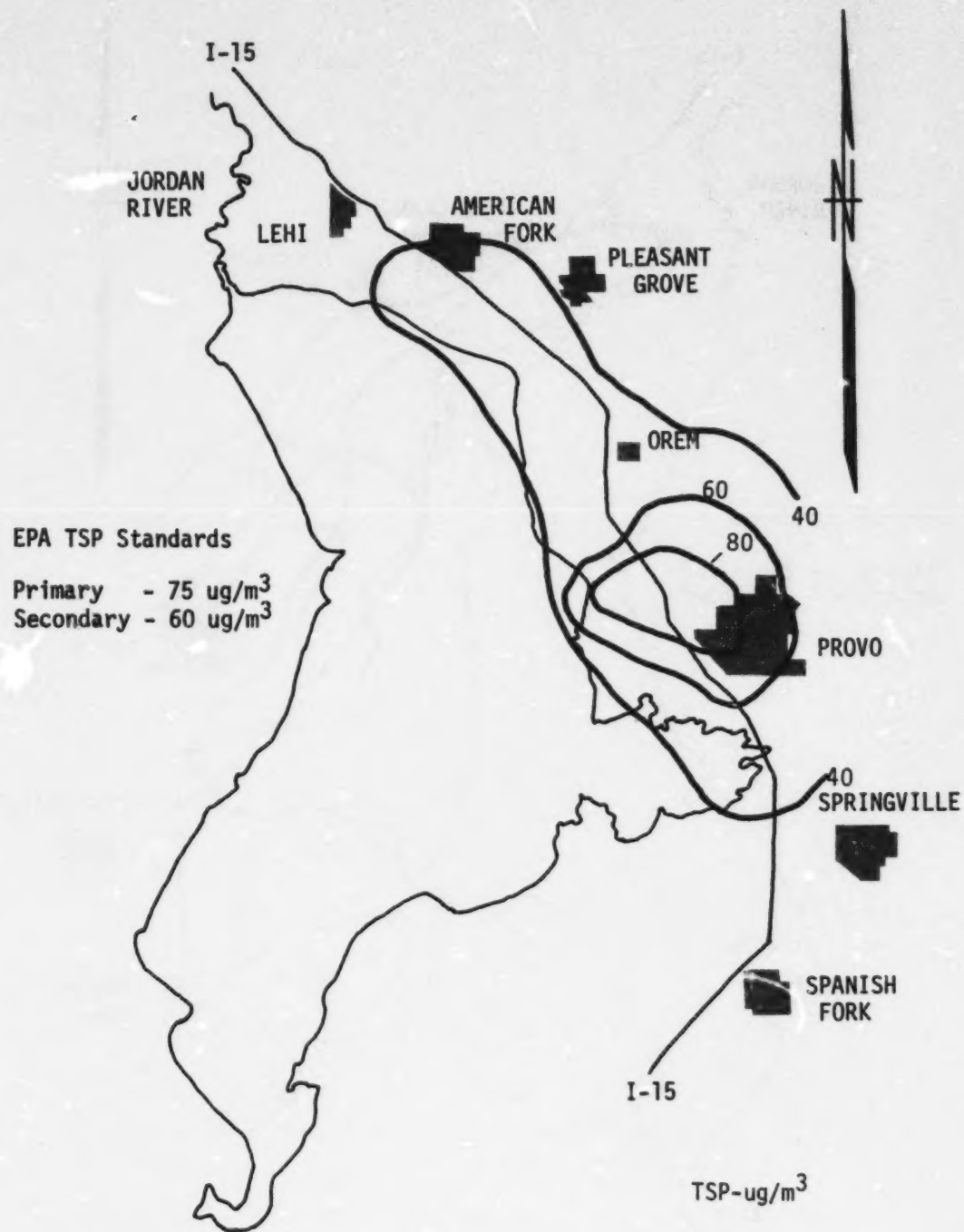


FIGURE VI-20
ANNUAL AVERAGE PARTICULATE CONCENTRATION
PROVO 1974

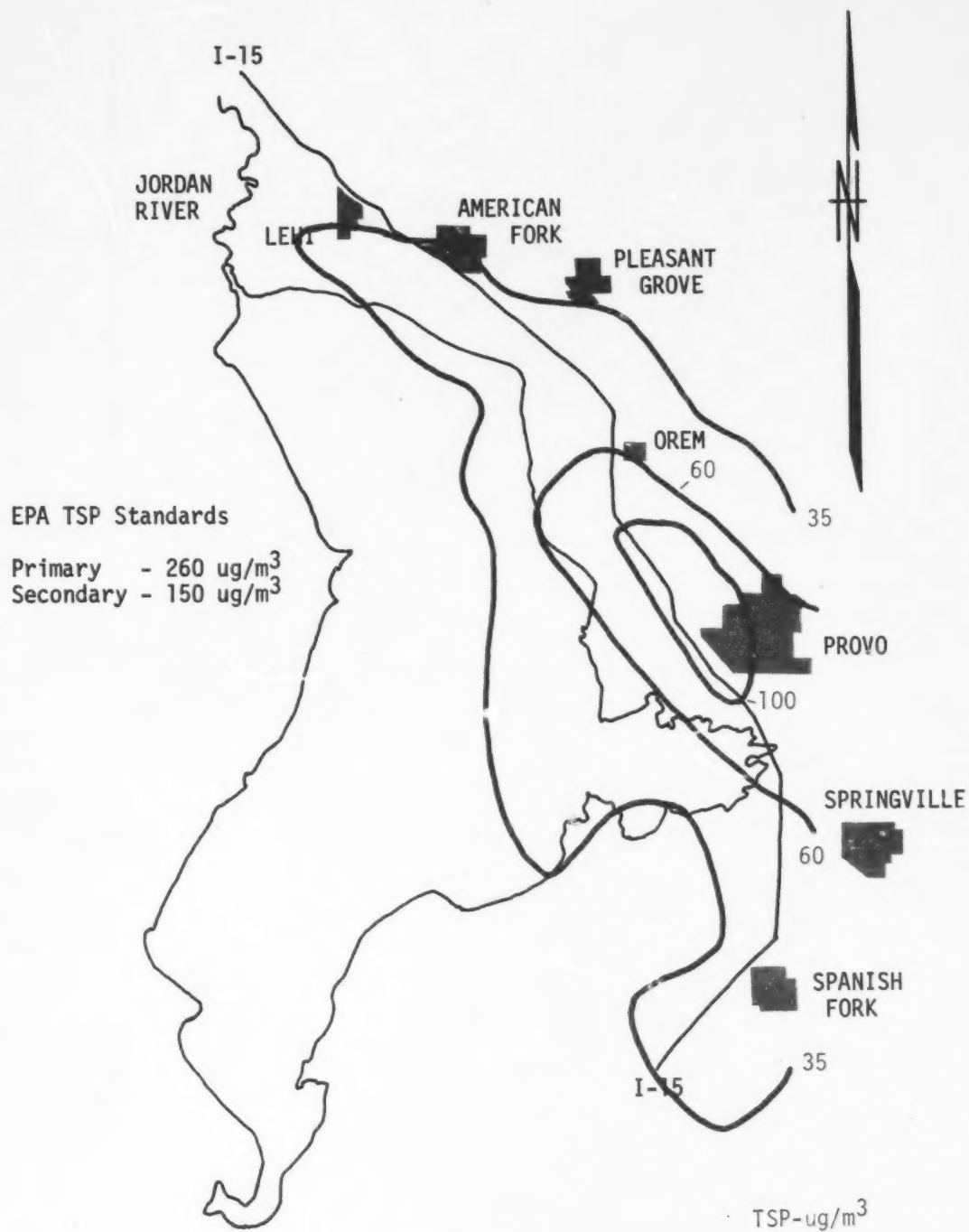


FIGURE VI-21

24-HOUR MAXIMUM PARTICULATE CONCENTRATION

PROVO 1995

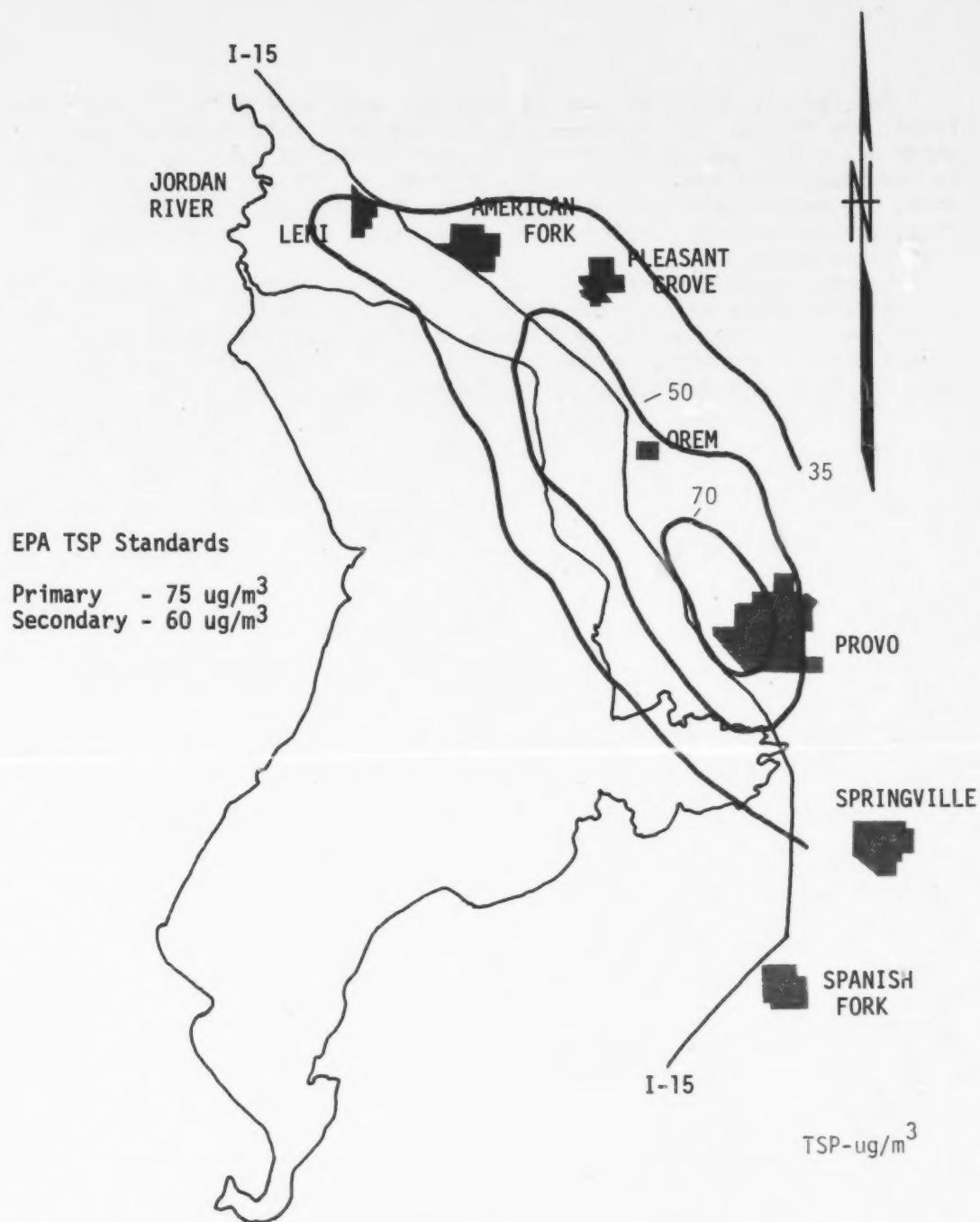


FIGURE VI-22
ANNUAL AVERAGE PARTICULATE CONCENTRATION
PROVO 1995

Two factors should be kept in mind when considering the TSP isopleths. First, the 24-hour TSP isopleths are derived for a meteorological day which has a high potential for high concentrations of man-made pollutants. In the Study Area, the highest concentrations of TSP do not occur on such days, but rather under weather conditions conducive to "dust storms." Thus, the 24-hour TSP isopleths are conservative when compared with historical data.

Second, there are uncertainties regarding the geographic impact of the particulate emission controls described in the SIP. This subject is discussed in Chapter IX. SIP implementation could reduce the predicted 24-hour and annual concentrations, but available data were inadequate to permit definition of likely results.

CHAPTER VII

RELATIONSHIP TO OTHER FEDERAL, STATE, AND LOCAL PROGRAMS

INTRODUCTION

The purpose of this Chapter is to present a brief description of the Federal, State, and local programs which may be affected by implementation of the Plan or which affect the Plan implementation. These programs include projects associated with the Central Utah Project, the Jordan-Provo Parkway, Army Corps of Engineers programs, and the Areawide Wastewater Management Planning (208) Programs.

CENTRAL UTAH PROJECT

The Central Utah Project is a major statewide effort designed to make Colorado River water available to the urban areas of Salt Lake City and Provo through a series of dams, reservoirs, and aqueducts.

The largest unit of the Central Utah Project affecting the Study Area is the Bonneville Unit, illustrated in Figure VII-1, which is estimated to cost over \$450 million and 25 years to complete. Water from Uinta Mountains will be diverted through the Strawberry Aqueduct to the enlarged Strawberry Reservoir (270,000 to 1,106,500 acre-feet), then to Utah Valley for further distribution to points both north and south. There will be two additional reservoirs along the Strawberry Aqueduct, which will serve as regulating reservoirs and will also be developed into recreational areas. Water will be released from Strawberry Reservoir through the pressurized Syar Tunnel traversing the Great Basin divide. It will then pass into the Syar, Sixth Water and Dyne power plants, respectively. As the water comes down Diamond Fork Canyon, it will either be stored in the new Hayes Reservoir or be diverted into the Wasatch Aqueduct. Hayes Reservoir will release water into Utah Lake and to the Southern part of Utah County for municipal and agricultural purposes.

Another feature of the Bonneville Unit is improved utilization of Utah Lake. The lake has a capacity of more than 850,000 acre-feet but loses an estimated 300,000 acre-feet annually to evaporation. The lake area, under current planning, will be reduced by diking, thus reducing evaporation. Provo Bay and Goshen Bay are proposed to be diked off from the rest of the lake, reducing the surface area by approximately one-third. The water now being lost through evaporation will then be stored in the proposed Jordanelle Reservoir in Wasatch County where the evaporation losses will be greatly reduced as a result of the cooler temperature and reduced surface area. The reclaimed Provo Bay area would be developed into a new agricultural area. It is proposed to develop Goshen Bay as a game preserve. Water from the Jordanelle Reservoir will be released into the Provo River through Deer Creek Reservoir and then to the Jordan Aqueduct. The Jordan Aqueduct will supply water to Salt Lake County. Waters will also be released from Jordanelle Reservoir to meet Northern Utah County municipal

requirements. Flood control and storage on the Jordan River will be facilitated by the proposed Lampton Dam near 9800 Street South. The reservoir and surrounding area is planned as a multipurpose facility and is part of the Salt Lake County Master Plan, under the name of Jordan Lake.

An enlargement of the existing Mona Reservoir in Northern Juab County on Currant Creek has also been proposed. The enlarged capacity would supplement irrigation needs and provide limited recreation use.

The implementation of the various projects comprising the Central Utah Project can have significant impact on water quality management in the Utah Lake-Jordan River Basins. Large quantities of imported water will tend to increase streamflows thus increasing waste load assimilative capacity of the area's streams. This additional high-quality imported water will also improve water quality through simple dilution.

Other actions within the Central Utah Project may have adverse or unknown impacts on water quality. Diking of Provo Bay will result in a loss of an important fresh water marshland which is the primary assimilator of waste loads to Utah Lake. Provo Bay also serves as an important bird refuge. Additionally, the diking of Provo and Goshen Bays will ultimately change both the biological and chemical make up of Utah Lake. Whether this change will be environmentally beneficial or not is unknown. The construction of Lampton Reservoir on the Jordan River could result in excessive aquatic plants growth because of excess nutrients present in the River; thereby, making the reservoir unsuitable for recreational purposes.

JORDAN-PROVO PARKWAY

In 1971, a study was conducted by Salt Lake County to investigate alternatives to channelization of the Jordan River for flood control purposes. The study report recommended the creation of a park within the flood plain and development of the river for recreation. The recommendations were accepted by the County and as a result, a governmental agency, the Jordan-Provo Parkway Authority, was established to oversee the Parkway development.

The Parkway will include an area bordering the Jordan River from the Jordan Narrows to Farmington Bay and another section along the lower reaches of the Provo River. The park will focus on the natural qualities of the river with bank terracing and landscaping designed to enhance aesthetic values and recreation potential. Land and water rights acquisition for the Parkway is presently in progress.

The Parkway is seen to have a beneficial impact on the Plan in terms of providing more aesthetic opportunities to enjoy the rivers and guaranteeing the right of access to a greater number of people. However, as indicated in Chapter IV, the Plan is not expected to significantly improve the DO and nutrient concentrations in the Jordan River, although health aspects through improved disinfection practices will be realized. Non-point sources of pollution and stormwater discharges must be controlled before the DO and nutrient problems can be eliminated. Because of the work effort of the 208 Programs in

this area, it is anticipated that the water quality of the Jordan River can be improved to a level commensurate with the goals of the Jordan River Parkway.

ARMY CORPS OF ENGINEERS

The Corps of Engineers is heavily involved in several flood control and water resource programs and studies for the Study Area. Recently completed Flood Plain Information Studies include:

- . Jordan River - Cudahy Lane to 5700 Street South
- . Jordan River - Jordan Narrows to 5700 Street South
- . Provo River and Slate Canyon Creek
- . Provo River and Rock Canyon Creek
- . American Fork River and Dry Creek
- . Hobbie Creek at Springville
- . Mill, Barton, and Stone Creeks.

Other Corps projects include a feasibility study to improve boating facilities on Great Salt Lake near Garfield, flood control projects for the Spanish Fork River and the Surplus Canal, and the Little Dell multi-purpose reservoir in Mountain Dell Canyon. A feasibility study is now nearing completion for additional flood control on the Jordan River from 21st Street South to Great Salt Lake. This study parallels the Parkway Authority's efforts to establish the river flood plain as a park. The estimated cost of this project is \$28,000,000.

AREAWIDE WASTEWATER TREATMENT MANAGEMENT PLANNING (208) PROGRAMS

There are three ongoing 208 Programs within the Study Area:

- . Mountainlands 208 Program (Utah and Wasatch Counties)
- . Salt Lake County 208 Program (Salt Lake County)
- . Weber River 208 Program (Davis County).

These programs will provide plans for wastewater management over a 20 year planning period and include facilities planning. A number of water quality, non-point source pollution, and land use issues identified in this report are expected to be resolved through the 208 planning process. The three 208 Programs in the Study Area are placing particular emphasis on wastewater treatment facilities planning, non-point source pollution controls, and the institutional arrangements required to implement a viable water quality management plan.

UTAH STATE IMPLEMENTATION PLAN

The Utah State Implementation Plan for the attainment and maintenance of air quality stipulates a variety of strategies which must be implemented in order to achieve required reductions in concentrations of carbon monoxide. These strategies include control of auto emissions, reductions in driving, improved traffic control, and increased use of public transportation and are mandated for attainment of CO standards by July 1977.

The control strategy for carbon monoxide (draft revision, dated May 19, 1975, to Chapter V, Part B, Utah Implementation Plan) calls

for a 22 percent reduction in one-hour maximum CO concentrations in Salt Lake City, and no reduction in Provo. The strategy requires a 59 percent reduction in 8-hour maximum concentrations in Salt Lake City, with 55 percent reduction in Provo. The air quality analysis indicates that, by 1995, the one-hour maximum will be reduced by about 59 percent in Salt Lake City and 71 percent in Provo, and that the eight-hour maximum will be reduced about 79 percent in Salt Lake City and 76 percent in Provo. Therefore, carbon monoxide standards should be achieved by 1995; however, based on the air quality analysis, there is some doubt as to the attainment of these standards in the Salt Lake City basin by 1985. Attainment of the CO standards by the currently mandated 1977 deadline is an issue which requires a greater level of analysis than is presented in this report.

SOIL CONSERVATION SERVICE

The U. S. Soil Conservation Service, through numerous Soil Conservation District Programs, is applying conservation land treatment measures on cropland to prevent erosion and sedimentation. These programs have an impact on non-point sources of pollution.

CHAPTER VIII

UNAVOIDABLE ADVERSE IMPACTS

INTRODUCTION

Certain adverse environmental impacts are unavoidable by the very nature of implementing a wastewater treatment plan and as a consequence of the development projected to occur. These unavoidable impacts result from constructing facilities and interceptors and the changes in land use which they precipitate. These impacts are presented in Tables VIII-1 to VIII-5 for the various alternatives in each area. An attempt was made to rank the severity of impacts among each area's alternatives. The following discussion is germane to understanding the Tables.

UNAVOIDABLE ADVERSE IMPACTS

The cost of implementing any wastewater treatment alternative can be considered to be an unavoidable adverse impact. As a basis for relating costs among alternatives, the costs of implementing alternatives within each area were considered to yield from limited (L) to severe (S) adverse impacts. These ranked impacts are for purposes of comparing alternatives in Tables VIII-1 to VIII-5 and do not necessarily relate to projected impacts on the population.

Typically, the lower two to four alternatives were judged to have the least (L) impact while the most expensive four or so alternatives had the most (S). The comparison was not made between areas. It is possible that the least costly alternative in one area is more expensive than the most costly in another. Assuming no Study Area wide authority would serve to distribute costs equitably, the above, areal analysis is perceived to be valid.

Economic Burden on Low Income Groups

A more significant measure of unavoidable, adverse economic impacts is found in the economic burden on low income groups. Because Central Utah County and Wasatch County alternatives were estimated to consume between 3.5 to 5.4 percent of low income families annual income, they were rated severe (S) in unavoidable adverse impact. In comparison, Salt Lake County alternatives were considered to yield limited (L) unavoidable adverse economic impacts on low income families because they require less than 2.9 percent of annual income.

Increased Non-Point Pollution

As development occurs, the changes in land use activities will alter the quantity of non-point source (runoff) pollution. The increase in runoff pollution (if any) is dependent upon the land use changes, control practices, and the parameter in question; however, different increases caused by various alternative wastewater treatment schemes within an area cannot be estimated at this level of planning. A comparison can only be made between areas. Additionally, not all non-point pollution is unavoidable. The current 208 Programs are analyzing non-point control measures, but these potential controls are not considered in the analysis presented herein.

Increased Point Source Pollution

Increases in point pollution result from development and vary with the treatment level and parameter considered. Based on the waste load estimates presented in Chapter IV, increases in point source pollution are judged moderate in Central Utah County and of no concern in Wasatch County. A negligible to limited unavoidable adverse impact is anticipated elsewhere.

Disruption of Aquatic Habitat

Certain adverse impacts on the aquatic habitats are unavoidable during and after construction of new outfalls or discharge locations. The most serious of problems can be expected in Davis County, Central Utah County, and Wasatch County where alternatives include new discharge locations. No significant unavoidable adverse impacts on aquatic habitats are anticipated elsewhere in the Study Area.

Encouragement of Sprawl Development

Without strict land use controls, the impetus for sprawl, linear, or scattered development is greatest in those alternatives which include long interceptors. The potential for unavoidable adverse impacts resulting from this kind of development was considered severe for most regional alternatives. The exception occurs in Salt Lake County where new interceptors will cross already developed land or land which will probably experience development with or without interceptors.

Disruption of Canyonlands

The disruption of canyonlands is a significant unavoidable adverse environmental impact in Central Utah County for all alternatives simply because growth and development will place more pressure on canyonland recreational uses. If WC-6 was implemented in Wasatch County, the disruption of Provo Canyon would be severe because of the growth induced by the canyon interceptor.

Localized Aesthetic Problems

Localized aesthetic problems are an unavoidable adverse environmental impact in areas where treatment plants are to be maintained in close proximity to residential development. Potential odors and psychological resentment most likely cannot be totally avoided in these areas. These unavoidable impacts are most significant in Davis County, Salt Lake County, and Northern Utah County because of the proximity of some plants to residential development.

Potential Water Rights Problems

Potential water rights issues may present a problem in those alternatives which include a relocation of existing discharges. The more the regionalization, the higher the potential for adverse water rights impacts. Whether or not these impacts can be avoided can only be answered at the time of implementation.

Disruption of Terrestrial Ecosystem

Disruption of the terrestrial ecosystem in some areas is unavoidable during construction of sewage works and as a consequence of subsequent development. In general, the alternatives which include regionalization, long interceptors, and/or new plant sites and outfalls are considered to present the most severe adverse impacts.

Archaeological/Historic Site Impacts

The level of existing planning is not sufficiently detailed to precisely judge the potential for unavoidable adverse impacts associated with archaeological and historic sites. Plan alternatives including expansions, new interceptors, or outfalls in the vicinity of known sites were judged to have a severe impact. Further planning together with archaeological and historical surveys will have to be accomplished to refine these judgements.

Flood Hazards

Unavoidable flood hazards are minimal in the Study Area. Only the Murray and Tri-Community facilities in Salt Lake County are within defined flood plains. For Salt Lake County alternatives which include these facilities, the unavoidable adverse impact for potential floods was judged severe. Furthermore, expansion of the Salt Lake City Suburban Sanitation District No. 1 facility to the north would require flood proofing to avoid flood hazards.

Air Quality

Although unavoidable adverse air quality impacts are not amenable to presentation in tabular form because all wastewater treatment alternatives are based on a common land use plan, certain adverse air quality impacts could result from Plan implementation. Over 70 percent of the TSP emissions are not regulated by the State Implementation Plan (SIP) and include several types of sources which may increase as a result of urban growth and development. For example, TSP emissions from road and building construction activities, emissions from space heating, and emissions from sanding of streets and highways might be expected to increase. TSP emissions from automotive vehicles may increase because the number of vehicle-miles driven more than offsets expected reductions in emissions per vehicle-mile. On the other hand, a few types of emissions may decrease (e.g., emissions from agricultural activities as farmlands are connected to other uses, and entrained dust from travel over unpaved roads). In total, while the SIP makes provision for significant reductions in the more readily controllable emissions from point sources, possible increases in the factors that contribute most to high particulate pollutant levels may tend to offset the gains obtained through implementation of the SIP. Not all of these adverse impacts are unavoidable. Several mitigating measures beyond the SIP for control of future TSP concentrations are presented in Chapter IX.

TABLE VIII-1

UNAVOIDABLE ADVERSE IMPACTS

	Wastewater Treatment Alternatives													
	Davis County													
<u>Unavoidable Adverse Impacts</u>	<u>1</u>	<u>2</u>	<u>3</u>	<u>4</u>	<u>5</u>	<u>6</u>	<u>7</u>	<u>8</u>	<u>9</u>	<u>10</u>	<u>11</u>	<u>12</u>	<u>13</u>	<u>REC</u>
Cost of Implementation	S	L	S	M	S	M	S	M	M	M	L	M	L	L
Economic Burden on Low Income Groups	M	M	M	M	M	M	M	M	M	M	M	M	M	M
Increased Non-Point Pollution	N/L	N/L	N/L	N/L	N/L	N/L	N/L	N/L	N/L	N/L	N/L	N/L	N/L	N/L
Increased Point Source Pollution	N/L	L	L	L	L	L	L	L	L	L	L	L	L	L
Disruption of Aquatic Habitat	L	L	L	L	L	L	L	L	M	L	L	L	L	L
Encouragement of Sprawl Development	L	L	L	L	S	S	S	S	S	L	L	S	S	S
Disruption of Canyonlands	N	N	N	N	N	N	N	N	N	N	N	N	N	N
Localize Aesthetic Problems	M	M	M	M	M	M	M/S	M/S	M/S	M/S	M/S	M/S	M/S	M/S
Potential Water Rights Problems	N	N	N/L	N/L	L/M	L/M	L/M	L/M	M	L/M	L/M	M	M	M
Disruption of Terrestrial Ecosystem	N/L	N/L	L	L	M/S	M/S	M/S	M/S	M/S	M/S	M/S	M/S	M/S	M
Archaeological/Historic Site Impacts	N	N	N	N	N	N	N	N	S	N	N	N	N	S
Flood Hazards	N	N	N	N	N	N	N	N	N	N	N	N	N	N

LEGEND:

S = Severe Adverse Impact
M = Moderate Adverse Impact
L = Limited Adverse Impact
N = No Adverse Impact

TABLE VIII-2

UNAVOIDABLE ADVERSE IMPACTS

Unavoidable Adverse Impacts	Wastewater Treatment Alternatives Salt Lake County											
	1	2	3	4	5	6	7	8	9	10*	11	12
Cost of Implementation	S	M	S	L	S	S	S	M	L	L	M	M
Economic Burden on Low Income Groups	L	L	L	L	L	L	L	L	L	L	L	L
Increased Non-Point Pollution	N/L	N/L	N/L	N/L	N/L	N/L	N/L	N/L	N/L	N/L	N/L	N/L
Increased Point Source Pollution	N/L	N/L	N/L	N/L	N/L	N/L	N/L	N/L	N/L	N/L	N/L	N/L
Disruption of Aquatic Habitat	N/L	L	N/L	L	N/L	N/L	N/L	N	L	N/L	N/L	N/L
Encouragement of Sprawl Development	N/L	N/L	N/L	N/L	N/L	N/L	N/L	N/L	N/L	N/L	N/L	N/L
Disruption of Canyonlands	N	N	N	N	N	N	N	N	N	N	N	N
Localize Aesthetic Problems	M	M	M	M	M	L/M	L/M	L/M	M	L/M	L/M	L/M
Potential Water Rights Problems	N	N	L	L	M	M/S	S	S	M	M/S	S	M/S
Disruption of Terrestrial Ecosystem	N/L	N/L	M	M	M	M	M	M/S	M	M	M	M/S
Archaeological/Historic Site Impacts	N	N	S	S	S	S	S	S	S	S	S	S
Flood Hazards	S	S	S	S	S	N	N	N	S	N	N	N

LEGEND:

S = Severe Adverse Impact
M = Moderate Adverse Impact
L = Limited Adverse Impact
N = No Adverse Impact

* Recommended Plan

TABLE VIII-3

UNAVOIDABLE ADVERSE IMPACTS

Unavoidable Adverse Impacts	Wastewater Treatment Alternatives Northern Utah County												
	1	2	3	4	5	6	7	8	9	10	11	12	REC
Cost of Implementation	S	L	M	S	S	L	M	L	S				L
Economic Burden on Low Income Groups	M	M	M	M	M	M	M	M	M				L
Increased Non-Point Pollution	N	N	N	N	N	N	N	N	N				N
Increased Point Source Pollution	L	L	L	L	L	L	L	L	L				L
Disruption of Aquatic Habitat	N/L	N/L	N/L	N/L	N/L	N/L	N/L	N/L	N/L	Not Currently Valid	Not Currently Valid	Not Currently Valid	N/L
Encouragement of Sprawl Development	L	L	L	L	S	S	S	S	S	Not Currently Valid			S
Disruption of Canyonlands	N	N	N	N	N	N	N	N	N				N
Localize Aesthetic Problems	L/M	L/M	L/M	L/M	M	M	L	L/M	L/M				M
Potential Water Rights Problems	N	N	S	L/M	M	M	M	S	S	Not Currently Valid			M
Disruption of Terrestrial Ecosystem	N/L	N/L	L	L	M	M	M/S	M/S	M				M
Archaeological/Historic Site Impacts	N	N	N	N	N	N	N	N	N				N
Flood Hazards	N	N	N	N	N	N	N	N	N				N

LEGEND:

S = Severe Adverse Impact
M = Moderate Adverse Impact
L = Limited Adverse Impact
N = No Adverse Impact

TABLE VIII-4

UNAVOIDABLE ADVERSE IMPACTS

Unavoidable Adverse Impacts	Wastewater Treatment Alternatives Central Utah County												
	1	2	3	4	5	6	7	8	9	10	11	12	REC
Cost of Implementation	S	M	S	M	S	L	M	S	M	M	S	L	L
Economic Burden on Low Income Groups	S	S	S	S	S	S	S	S	S	S	S	S	S
Increased Non-Point Pollution	N	N	N	N	N	N	N	N	N	N	N	N	N
Increased Point Source Pollution	L/M	M	L/M	M	L/M	M	M	M	M	M	L/M	M	M
Disruption of Aquatic Habitat	N/L	N/L	N/L	N/L	N/L	N/L	L/M	L/M	L/M	L/M	N/L	N/L	N/L
Encouragement of Sprawl Development	L	L	S	S	S	S	S	L	S	S	S	S	S
Disruption of Canyonlands	L/M	L/M	L/M	L/M	L/M	L/M	L/M	L/M	L/M	L/M	L/M	L/M	L/M
Localize Aesthetic Problems	L/M	L/M	M	M	M	L/M	L/M	L/M	L/M	L/M	L/M	L/M	L/M
Potential Water-Rights Problems	N	N	N/L	N/L	M	M	M/S	M/S	M/S	S	S	S	M
Disruption of Terrestrial Ecosystem	N/L	N/L	M	M	M	M	M/S	M/S	M/S	M/S	M/S	M/S	L
Archaeological/Historic Site Impacts	N	N	N	N	N	N	S	S	S	S	S	S	N
Flood Hazards	N	N	N	N	N	N	N	N	N	N	N	N	N

LEGEND:

S = Severe Adverse Impact
 M = Moderate Adverse Impact
 L = Limited Adverse Impact
 N = No Adverse Impact

TABLE VIII-5

UNAVOIDABLE ADVERSE IMPACTS

Unavoidable Adverse Impacts	Wastewater Treatment Alternatives Wasatch County						
	T	2	3	4	5	6	REC
Cost of Implementation	M	L	M	L	S	S	L
Economic Burden on Low Income Groups	S	S	S	S	S	S	S
Increased Non-Point Pollution	N	N	N	N	N	N	N
Increased Point Source Pollution	N	N	N	N	N	N	N
Disruption of Aquatic Habitat	N/L	L/M	L/M	N/L	N/L	N/L	L/M
Encouragement of Sprawl Development	L	L	S	S	S	S	S
Disruption of Canyonlands	N	N	N	N	N	S	N
Localize Aesthetic Problems	M	M	N	N	N	M	N
Potential Water Rights Problems	N	M	S	S	S	S	S
Disruption of Terrestrial Ecosystem	N/L	L	S	S	S	S	S
Archaeological/Historic Site Impacts	N	N	N	N	N	S	N
Flood Hazards	N	N	N	N	N	N	N

LEGEND:

S = Severe Adverse Impact
 M = Moderate Adverse Impact
 L = Limited Adverse Impact
 N = No Adverse Impact

CHAPTER IX

MITIGATING MEASURES

Mitigating measures are those actions which can be taken in conjunction with implementation of any wastewater treatment alternative to reduce or compensate for adverse environmental impacts associated with implementation. The following mitigating measures have been identified:

1. Land use management including zoning, tax incentives, sewer use ordinances, tap fees, etc., to minimize undesirable development patterns resulting from plan implementation.
2. Extensive and intensive non-point source monitoring and evaluation program to identify and quantify the character of non-point pollution contributing to poor water quality and the development of cost effective control strategies. This is particularly important in the lower Jordan River area where stormwater runoff appears to be a major problem. The ongoing 208 Programs are focusing on the non-point source problems.
3. Identification and quantification of infiltration/inflow problems and the implementation of abatement programs to decrease demands on sewer and treatment plant capacities. This is particularly important in the Heber Valley area.
4. Analysis of potential tax relief mechanisms to ease the economic burden on low income groups.
5. Archaeological and historical site reconnaissance prior to final plan implementation to minimize potential for adverse impacts on these types of sites.
6. Maintenance of proper techniques during construction of facilities and interceptors to minimize problems such as:
 - a. dust
 - b. noise
 - c. air pollution
 - d. runoff pollution
 - e. loss of vegetation and wildlife.
7. Reanalysis of land disposal and recycle-reuse options as a means of minimizing impact of wastewater effluents on surface streams. This issues is being investigated by the ongoing 208 Programs.
8. Strict controls on canyonland development and use to minimize impact of increased demand from future growth.
9. Where existing facilities are abandoned, restore land to some other useful purpose such as parks, etc.
10. Return of interceptor corridors to native ecosystem after construction.
11. Landscaping, aesthetic design, odor control, etc., particularly at the following treatment plants:

- a. North Davis
 - b. Central Davis
 - c. Granger-Hunter
 - d. Cottonwood
 - e. Murray
 - f. Tri-Community
 - g. Sandy
 - h. American Fork
 - i. Springville
 - j. Heber
12. Utilization of dispersion and diffusion tubes on lake outfalls to minimize localized adverse water quality impacts. Alternatives include DC-3 through DC-13, SLC-8, SLC-12, NUC-3, NUC-4, NUC-7, NUC-8, NUC-10 through NUC-12, and CUC-7 through CUC-12.
 13. Adequate flood proofing and flood protection at the Murray and Tri-Community facilities for alternatives SLC-1 through SLC-5, and SLC-9.
 14. Protection of wildlife habitat in designated refuges during construction of alternatives DC-9, CUC-5 through CUC-12, and the CUC recommended plan.
 15. Special construction techniques to minimize disruption of Jordan River ecosystem as a result of interceptors crossing the River in alternatives SLC-3 through SLC-12 and the SLC recommended plan.
 16. Because CO concentrations in 1995 are expected to be below standards, no specific mitigating measures are required in general. However, there will probably be local places where CO concentrations will exceed one and 8-hour standards on particular occasions resulting from local heavy traffic. These conditions should be anticipated and strategies developed to mitigate their effects. Compliance with CO standards will be difficult through much of the intervening period and careful monitoring of CO concentrations will be necessary to determine the effectiveness of the SIP.
 17. Particulate concentrations are expected to exceed standards in 1995. The magnitude of the particulate problem is illustrated by the fact that only 30 percent of the particulate emissions in the Study Area come from man-made point sources for which Utah State Implementation Plan controls are applicable. Control measures, such as those embodied in the SIP, should certainly be implemented, but a 50 percent reduction in emissions from sources subject to control may reduce the total Study Area TSP emissions by only 15 percent. Mitigating measures beyond those described in the SIP may be needed. Chemical stabilization or sprinkling of dirt surfaces, construction of wind-breakers, and reduced sanding of roads could be effective in reducing fugitive dust. Energy conservation and decreased

automotive traffic in some regions could reduce man-made TSP emissions over the critical areas. Further study would be necessary to find the most practical and cost-effective mitigating measures for the Study Area.

CHAPTER X

IRREVERSIBLE AND IRRETRIEVABLE COMMITMENTS OF RESOURCES

Most major construction activities or plan implementation can be expected to cause irreversible or irretrievable commitments of human and natural resources either within the useful life of the project or some other reasonable time frame. There are numerous such commitments inherent within the wastewater treatment alternatives. They include:

1. The energy, concrete, steel, other construction materials, chemicals, and manpower required to build, operate, and maintain the facilities, interceptors, and outfalls.
2. Implementation of the Plan will foreclose certain future growth control options.
3. Land development made possible by construction of any set of alternatives will irreversibly commit land to other uses. Once developed, these new growth areas are unlikely to revert to a natural condition or to agricultural use.
4. An appreciable amount of land will be committed to use for wastewater treatment purposes.
5. A significant amount of Federal, State, and local money will be irretrievably committed to construct, operate, and maintain the sewage works.
6. Except for alternatives including lake outfalls, no alternatives foreclose future recycle-reuse options.
7. Land development and the associated urban growth will irretrievably commit air resources as a receptor of CO and TSP emissions. Such a commitment may affect the health and well being of the Study Area population.

CHAPTER XI

RELATIONSHIP BETWEEN LOCAL SHORT TERM USES OF THE ENVIRONMENT AND THE MAINTENANCE AND ENHANCEMENT OF LONG TERM PRODUCTIVITY

The purpose of this Chapter is to define the extent to which the Plan involves tradeoffs between short term and long term environmental gains, and the extent to which implementation of the Plan forecloses future options. These issues are discussed in the following:

1. The increased wastewater effluent quality resulting from Level III or Level IV treatment may have marginal long term beneficial impacts on water quality in surface streams without management of non-point sources.
2. Alternatives utilizing secondary treatment do not foreclose the option for Level III, Level IV, or other higher level of treatment in the future should circumstances warrant.
3. Except for those alternatives containing recommendations for lake outfalls, no alternatives preclude future consideration of land disposal. The capital costs of long outfall lines are perceived to be an impediment to future ultimate disposal options such as land disposal.
4. Regionalization schemes may sacrifice long term environmental enhancement of one area at the expense of another.
5. Sewering of Provo Canyon has the short term benefit of eliminating discharges to the upper Provo River, but long term environmental enhancement may be adversely impacted by increased growth and high density development induced by the interceptor.
6. Windfall profits may result from any major regionalization schemes, including the Provo Canyon interceptor, as the value of undeveloped land adjacent to interceptors increases in value.
7. The short term gain in water quality realized by regionalization in Heber Valley may be offset by long term losses as a result of an effluent discharge closer to Deer Creek Reservoir.
8. Short term water quality gains in the Study Area due to implementation of Level III treatment may have insignificant long term advantage over secondary treatment without control of non-point sources.
9. Development of agricultural lands will not necessarily result in elimination or disruption of particularly unique vegetation associations, but the elimination of tilled acreage and a commitment of it to development will place increased pressure on the wildlife that is dependent upon the man-created habitat.
10. With regards to carbon monoxide as an air pollutant, no significant short term (1977) change in air quality is indicated, but the long term (1995) impacts include a marked improvement in CO concentrations.
11. With regard to particulates as an air pollutant, no significant short term (1977) change in air quality is indicated. For the long term (1995), improvements in TSP concentrations will be slight, but violations of air quality standards are to be expected.

CHAPTER XII

COURSE OF ACTION

The Utah Lake-Jordan River Water Quality Management Plan recommends expansion of wastewater treatment facilities through regionalization along with upgrading treatment efficiencies to meet Utah's Level III effluent requirements. The water quality regulations of Utah establish effluent requirements of Level III treatment prior to discharge of domestic wastewater by July, 1980. These 1980 effluent requirements provide for a high degree of removal of BOD, suspended solids, and coliform bacteria. The State of Utah considers these effluent requirements necessary to reduce, to an acceptable level, the health hazard associated with wastewater effluents as well as to achieve in-stream water quality standards. As permitted under Section 510 of the Federal Water Pollution Control Act, the State of Utah has established these Level III effluent requirements which are more stringent than those called for under the time-tables in the Federal Act.

EPA's secondary treatment effluent limitations, are presently required to be met by all domestic wastewater discharges by July, 1977. Where necessary to attain water quality standards or where shown to be cost-effective, EPA supports the use of more advanced treatment levels resulting in a higher quality effluent.

The relationship between point and non-point pollution sources in determining in-stream water quality may create situations where advanced treatment levels such as Utah's Level III requirements are not needed immediately. Within the Study Area both point and non-point pollution sources cause violations of Utah's in-stream water quality standards. The Plan recommends controls for domestic wastewater point sources by specifying Level III effluent requirements throughout the Study Area. However, without the addition of non-point source controls, it is probable that in-stream water quality standards will not be achieved in some instances.

The three 208 Areawide Waste Treatment Management Planning Agencies which cover the Utah Lake and Jordan River Study Area will be recommending methods for control of non-point pollution sources. In areas where non-point pollution is the significant source, an evaluation of the degree of non-point vs. point controls can best be made by these ongoing 208 programs. In determining funding priorities over the next few years, it is necessary to analyze the costs and water quality benefits of various treatment levels and non-point source controls to determine the most cost-effective approach to meeting in-stream water quality standards in that area.

While EPA recognizes Utah's requirement of Level III treatment by July, 1980, Federal funds to aid in the construction of wastewater treatment facilities to meet this deadline are limited. Presently, EPA does not have sufficient funds to provide 75 percent Federal

funding of the estimated capital construction costs for providing Level III treatment for all proposed wastewater treatment facilities in the Utah Lake and Jordan River Basins. It is therefore necessary to determine the best possible way in which to utilize these limited Federal funds over the next few years to protect public health and to attain in-stream water quality standards.

At the completion of Final EIS review period, EPA expects to approve the Utah Lake-Jordan River Water Quality Management Plan. In supporting this action EPA believes that the recommended alternatives provide significant water quality benefits and will not produce significant adverse effects which cannot be mitigated through proper consideration during the 201 facilities planning process. During the facility plan-environmental assessment review process, EPA will give special consideration to certain potential site and project specific impacts which were identified in comments on the Draft EIS (See Chapter XIII). These potentially adverse impact categories include:

- . historic and archaeological sites
- . control of vector-borne diseases
- . energy requirements
- . flood hazards
- . engineering cost estimates
- . agricultural land use impacts
- . erosion control
- . recreational resources
- . earthquake hazards
- . sludge management
- . water rights

Where significant adverse effects within these or other impact categories may be expected for a particular facility, EPA will write an Environmental Impact Statement covering that individual project. EPA recognizes that changes may be made in the recommended alternatives during either the 201 Facilities Planning or 208 Areawide Wastewater Management Planning efforts. Such change will be considered and evaluated by EPA to determine their significance for creating adverse as well as beneficial impacts.

In approving the Plan, EPA expects implementation to occur in accordance with the following general priorities. First funding priority will be given to upgrading treatment plants to secondary treatment or to advanced levels of treatment (Level III, etc.) where necessary to attain in-stream water quality standards or where advanced treatment is found to be the most cost-effective wastewater treatment alternative. Second funding priority will be given to providing advanced treatment where an improvement in water quality is demonstrated in conjunction with control of non-point pollution sources. Third priority for funding advanced treatment will be given to those situations which do not fit the first two priority classes. This approach will spread the limited Federal funds among more projects on a priority basis, by first providing funds for Level III treatment only where such treatment is needed

to attain in-stream water quality standards or where Level III treatment is shown to be the most cost-effective alternative. This approach might require some municipalities and sanitation districts to upgrade treatment plants to secondary treatment now, and in a few years upgrade to Level III.

CHAPTER XIII

COMMENTS ON DRAFT EIS

The Draft Environmental Impact Statement for the Utah Lake-Jordan River Water Quality Management Planning Study (Draft EIS) was distributed to all interested government agencies, public groups, and individuals on 14 May 1976 by the U. S. Environmental Protection Agency, Region VIII, Denver, Colorado (EPA). Comments were solicited and received by EPA during a 45 day period following the distribution of the Draft EIS.

In order to facilitate public comment, EPA held a public hearing on the Draft EIS on 10 June 1976 at 2:00 p.m. and 7:00 p.m. in the Salt Palace, Suite A, 100 South West Temple, Salt Lake City, Utah. A copy of the proceedings of that public hearing is presented at the end of this Chapter.

The beginning of this Chapter is comprised of copies of all written comments to the Draft EIS and EPA's response thereto. Each written comment received is printed in total with the response immediately following. Paragraphs requiring response are numbered to coincide with EPA's response.

WRITTEN COMMENTS RECEIVED

AND

U. S. ENVIRONMENTAL PROTECTION AGENCY RESPONSES

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STATE OF UTAH

Calvin L. Hampton, Governor

**DEPARTMENT OF
DEVELOPMENT SERVICES**

Division of State History

Melvin T. Smith, Director
605 East South Temple

Telephone: (801) 533-5755

May 6, 1976

John A. Green
Regional Administrator
US Environmental Protection Agency
Region VIII
1860 Lincoln Street
Denver, Colorado 80203

Dear Sir:

Your request for information and/or comment on Utah Lake-Jordan River is receiving attention from the staff to the State Historic Preservation Officer. After review by an historian, architectural historian, and archeologist, we will inform you of known and potential historic and cultural sites, together with those recommendations made by staff specialists for further survey work where applicable.

Sincerely,

John S. H. Smith
Preservation Planning Specialist

JSMS:clw



STATE OF UTAH

Calvin L. Rampton, Governor
DEPARTMENT OF
DEVELOPMENT SERVICES

Milton L. Weilenmann,
Executive Director
430 State Capitol
Salt Lake City, Utah 84114
Telephone: (801) 533-5961
533-5961

May 24, 1976

John A. Green
Regional Administrator
U.S. Environmental Protection Agency
Region VIII
1860 Lincoln Street
Denver, Colorado 80203

Re: Utah Lake--Jordan River Water Quality Planning Study

Dear Mr. Green:

1 The staff to the State Historic Preservation Officer have reviewed the Draft Environmental Impact Statement, but feel that the questions of history and archeology are insufficiently addressed for them to make any kind of comment.

The area in question is the pioneer settlement core area, with previous Indian occupation over many years, and naturally contains many sites of interest and value. Without project development specifics, however, it is impossible to comment on impact on historic and archeological sites.

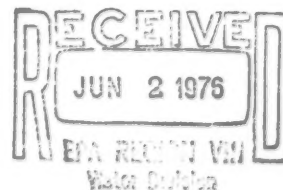
Sincerely,

DEPARTMENT OF DEVELOPMENT SERVICES

Milton L. Weilenmann
Milton L. Weilenmann
Executive Director

and
State Historic Preservation Officer

MLW:clw



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DIVISIONS OF: AERONAUTICS • FINE ARTS • EXPOSITIONS • INDUSTRIAL PROMOTION • TRAVEL DEVELOPMENT • STATE HISTORY

RESPONSE TO UTAH DEPARTMENT OF DEVELOPMENT SERVICES

1. Each 201 Facilities Plan will delineate potentially disturbed areas of concern. Conflicts with known or identified historic and archeologic sites will be identified during the 201 planning process and be considered in the site location and if not relocated all proper safeguards will be taken during construction. See response to U. S. Department of the Interior, Item 13.



DEPARTMENT OF HEALTH, EDUCATION, AND WELFARE
PUBLIC HEALTH SERVICE
CENTER FOR DISEASE CONTROL

May 20, 1976

BUREAU OF LABORATORIES
VECTOR-BORNE DISEASES DIVISION
POST OFFICE BOX 2087
FORT COLLINS, COLORADO 80522

Mr. John A. Green
Regional Administrator
U.S. Environmental Protection Agency
Region VIII
1860 Lincoln Street
Denver, Colorado 80203

Dear Mr. Green:

We have reviewed the draft environmental statement for Utah-Lake - Jordan River Water Quality Management Planning Study and we are submitting our comments regarding vector-borne disease impacts which might result from this project.

The extension of sanitary sewers and consolidation of sewage treatment facilities might be beneficial in regard to local mosquito vector problems. The extension of sewer service will encompass localized sewage treatment deficiencies (unsewered, septic tank, cess pools, and inadequate facilities) and in doing so, will eliminate conditions such as leaking, overflowing, and other inadequacies pertaining to poorly designed and maintained sewage systems. All of the foregoing tend to create mosquito producing habitats.

1 For any sewage system, there is a potential vector-borne disease problem. A primary vector of St. Louis Encephalitis, Culex pipiens favors water with high organic content. Culex tarsalis, the encephalitis mosquito, is also known to breed in these waters. Both species have been found in sewage stabilization ponds. It is important that design and maintenance of sewage systems include the control of vegetation on lagoons and similar holding facilities. Such factors should be considered in the basic planning of the project.

If we can further clarify any point or furnish any additional information, please let us know.

Sincerely yours,

Richard O. Hayes
Richard O. Hayes, Ph.D., M.P.H.
Chief, Water Resources Branch

cc: Mr. Ralph C. Barnes
Dr. Taira Fukushima

**RESPONSE TO CENTER FOR DISEASE CONTROL, DEPARTMENT OF HEALTH, EDUCATION,
AND WELFARE**

1. EPA concurs that the potential for vector-borne disease problems exist at wastewater treatment facilities and that proper operation and maintenance procedures should be practiced to negate these problems. Proper design and maintenance is part of the 201 planning process.



FEDERAL ENERGY ADMINISTRATION

REGION VIII

1075 South Yukon

P.O. Box 26247, Belmar Branch

Lakewood, Colorado 80226

May 21, 1976

Mr. John A. Green
Regional Administrator
Environmental Protection Agency, Region VIII
1860 Lincoln Street
Denver, Colorado 80203

Dear Mr. Green:

The FEA Regional Office has reviewed the Draft Environmental Impact Statement on the Utah Lake-Jordan River Water Quality Management Planning Study, in accordance with your letter dated May 14, 1976. The draft EIS appears to be a well-addressed study. Due to the enclosed nature of the Utah Lake-Jordan River drainage basins, the FEA concurs that environmental degradations will occur if a well thought out plan is not implemented.

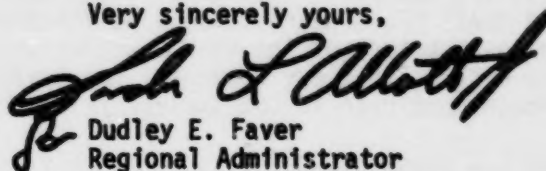
- 1 [The EIS does not, however, adequately address the energy related issues of the proposal. An energy assessment of the project should be undertaken for each alternative proposed for consideration. The waste water treatment plants that will be built will be energy consumers and should be evaluated on a comparative basis. The assessment should also consider the overall project impact to other energy consumers in the immediately serviced area (heavy industries, such as the copper mine, petroleum refineries, steel mill, etc.). The proposed action has either a direct or indirect impact on these industries which, in turn, affect energy development and consumption. An assessment of this nature could also provide a useful tool in the decisionmaking process for long-range conservation. The most environmentally sound alternative which utilizes the least operating power and energy resources should be as great a consideration in the selection process as the economic aspects of the project.
- 2 [In terms of the consumptive use of water, the report does address the growing needs of an increasingly urbanized and industrial development in the Utah Lake-Jordan River Basin.
- 3 [The assignment of water quality standards to all intrastate waters completed in 1972 would facilitate the water quality management planning effort.

4 [New facilities which might contribute to air pollution having to be reviewed by the State Division of Health prior to construction should promote opportunities for the state and federal government to render competent advice to industrial management relative to control requirements.

5 [Mitigating measures, as listed in Chapter 9, appear to be most complete; however, we would add the following suggestions to be considered: parallel planning of medical health and educational services with land use management; initiation of state conservation policies to protect the quality of air and water.

Thank you for giving us the opportunity to review and comment on this EIS, and to express our concerns in the area of energy consumption and impact.

Very sincerely yours,


Dudley E. Faver
Regional Administrator

cc: Dr. Robert Stern
NFEA, Washington, DC

RESPONSE TO FEDERAL ENERGY ADMINISTRATION

1. An assessment of the impact on energy consumption of each wastewater treatment alternative is difficult because of the number of variables affecting energy use including,
 - . length of interceptors and required pumping
 - . pumping requirements within facility
 - . energy requirements of specific unit processes selected
 - . design criteria of unit processes
 - . energy consumed in producing required equipment and material (concrete, glass, chlorine, etc.)

Additionally, each 201 Plan developed for specific treatment plants will analyze the energy requirements of the alternatives considered. Thus no detailed energy consumption analysis was attempted in the Draft EIS.

Notwithstanding the above, a comparison between the energy demands of secondary treatment and advanced wastetreatment is possible on a qualitative basis utilizing data developed in Municipal Sewage Treatment, A Comparison of Alternatives, Council on Environmental Quality and U. S. Environmental Protection Agency, Washington, D. C., February 1974. Data in this document includes estimates of average energy consumption, kwh/day, for typical secondary treatment systems as well as several forms of advanced wastetreatment including filtration and carbon adsorbtion. In some, but not all cases, energy consumption is presented by unit process or sub-system (e.g., primary, secondary, sludge, etc.) for a range of design capacities. The implications resulting from an analysis of these data are that wastewater treatment processes beyond conventional secondary systems can utilize significantly more energy. Longer aeration times, filter backwashing, carbon regeneration, and pumping all contribute to increased energy demands.

Unfortunately, no data are available to reflect the energy consumed in producing the material required for wastewater treatment plant construction, the energy used during construction, or the energy used to produce products, including chemicals used during operation.

2. EPA believes the consumptive use of water by urban and industrial development is an important issue but given the level of data currently available on this issue, it is deemed to be outside the scope of this EIS.
3. EPA does not completely understand this comment, however water quality standards have been established by the State of Utah and approved by EPA for intrastate waters.

4. State review and approval is required for significant potential air pollution sources.
5. EPA believes that these needs are being covered presently by local, State, and Federal government programs and therefore do not constitute mitigation measures.



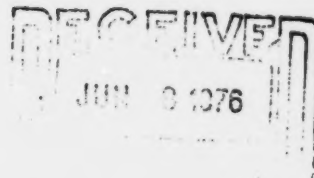
DEPARTMENT OF THE ARMY
SACRAMENTO DISTRICT, CORPS OF ENGINEERS
650 CAPITOL MALL
SACRAMENTO, CALIFORNIA 95814

REPLY TO
ATTENTION OF

SPKED-W

2 June 1976

Mr. John A. Green
Regional Administrator
Environmental Protection Agency
Region VIII
1860 Lincoln Street
Denver, CO 80203



Dear Mr. Green:

This is in reply to your 14 May 1976 letter inclosing for review and comments a draft environmental impact statement for the Utah Lake - Jordan River Water Quality Management Planning Study. The following comments on the draft statement are submitted for your consideration.

1 [As you have noted we are currently investigating flood and water related problems of the lower Jordan River from the Surplus Canal heading near 21st South in Salt Lake City downstream to the Great Salt Lake. Proposed improvements of Jordan River include recreation activities such as picnicking, hiking, bicycling, fishing, and boating which uses are dependent on suitable water quality in Jordan River to fully realize the floodway-parkway potential. Accordingly, our interest in the water quality management plan is the potential improvement of water quality in the lower Jordan River associated with implementation of Level III treatment of domestic wastewater and other measures which may be adopted to upgrade industrial and irrigation return flows and nonpoint sources to meet established water quality standards. Additional evaluations of such facilities are being considered in the current Salt Lake County 208 Study.]

2 [Consolidation of domestic wastewater treatment at the two regional facilities would eliminate current flood hazards at the Murray and Tri-Community plants as these plants would be abandoned. The existing Salt Lake City and Salt Lake Suburban #1 wastewater treatment facilities are not within flood hazard areas. However, expansion of Salt Lake Suburban #1 to the north would require flood proofing measures to avoid possible flood hazards.]

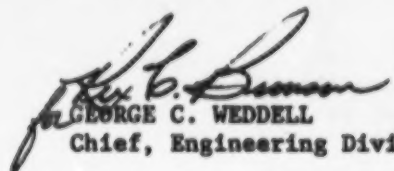
SPKED-W

2 June 1976

Mr. John A. Green, Regional Administrator

Thank you for the opportunity to comment on the draft environmental impact statement.

Sincerely yours,

A handwritten signature in dark ink, appearing to read "G. C. Weddell", is written over the typed name.

GEORGE C. WEDDELL

Chief, Engineering Division

RESPONSE TO CORPS OF ENGINEERS

1. EPA agrees with your recognition of the importance of water quality in the Jordan River in relationship to the proposed floodway/parkway project.
2. The text of the EIS has been changed to reflect the potential flood hazard if the Salt Lake City Suburban Sanitation District No. 1 facility should be expanded to the north. The ongoing Salt Lake County 208 Program is reviewing this issue. Additionally the 201 facilities planning process will review this issue in accordance with Executive Order 11296.

Mountainland

ASSOCIATION OF GOVERNMENTS

140 EAST CENTER STREET
PROVO, UTAH 84601
PHONE (801) 377-2282

June 3, 1976

Mr. Bob Doyle
Environmental Protection Agency
Region VIII
1860 Lincoln Street
Denver, Colorado 80203

Dear Mr. Doyle,

We appreciate the opportunity to comment on the Utah Lake-Jordan River 303 Environmental Impact Statement for the Water Quality Management Planning Study. You are well aware of the concern of our local elected officials on all matters of water pollution control and the need to make planning responsive to local needs. For those reasons we offer the following comments for your consideration and input to the final statement.

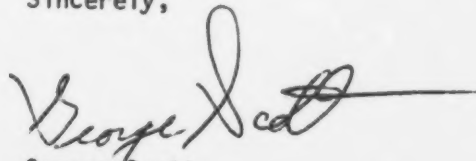
1. We agree with the recommendation of expansion of wastewater treatment facilities through regionalization (where feasible) along with upgrading treatment efficiencies to meet Utah's Level III effluent requirements.
2. Due to limited federal and state funds, we feel alternative 2 would be more desirable than alternative 1 at this stage. In this way, funding priorities can be given to upgrading plants in areas of greatest need.
3. Our recommendations for amending the Utah priority system for construction were presented to the Utah Water Pollution Committee on June 9, 1976.
4. We note that the estimated costs as presented in your report are far too low when compared with our data and cost figures. Any planning done with these costs will result in insufficient funding and financing problems.
5. We suggest that the completion of this EIS during the next 3 - 4 month period not delay or hold up funding for any projects presently under design. We feel they need to move ahead now in order to meet the 1977 standards.

- 5 [6. Ongoing 208 and 201 planning in the Mountainland area has already lead to changes from those displayed in the EIS. We trust that these local plans will be accepted as they use more up-to-date cost information and reflect the views of local elected officials. There may be considerable departure from the recommended plan due to new information developed in South Utah Valley.
- 6 [7. With a major impact identified from non-point source pollution, we suggest that both the State and EPA give consideration to giving financial assistance to implement "Best Management Practices" for non-point source control.
- 7 [8. Also please be advised that more intensive investigation and projection have been done on land use and population by the 208 agencies. With the definite anticipated impact of increased population, the local elected officials feel strongly that expansion of facilities now to meet these demands is required. There is no need to wait for problems of growth to occur when we can solve problems now, consistent with local growth policies, for far less money.

We realize that there is a continuing dialogue between the State of Utah and EPA concerning standards, criteria, programs, and funding. As long as these differences remain, local agencies like ourselves find it difficult to know which direction to move. We therefore suggest that any conflicts be resolved as soon as possible so priorities may be properly established and programs may move forward.

If there are any questions, please feel free to contact our office.

Sincerely,



George Scott
208 Water Quality Project Manager

GS:lab

RESPONSE TO MOUNTAINLAND ASSOCIATION OF GOVERNMENTS

1. See CHAPTER XII, COURSE OF ACTION
2. No response required.
3. We recognize that the costs presented are probably too low because they are based on 1973 capital cost estimates. These costs are not to be used for engineering purposes but only for comparison among alternatives. A note has been added to each cost table further clarifying these costs.
4. EPA agrees and every feasible effort will be made to move ahead to meet the 1977 standards.
5. EPA recognizes that the 208 Programs are developing more intensive analyses of land use and population projections than the data presented in the original study or subsequently used in the Draft EIS. The wastewater treatment cost estimates contained in the Draft EIS were based on 1973 price levels and considered only the original land use and population projections used in the original Plan. These cost data were developed only for preliminary estimates for comparison of alternatives. It is anticipated that the 208 Plans and 201 Plans will refine these estimates and provide more appropriate data for localized decision-making.
6. EPA recognizes the need for financial assistance for implementation of "Best Management Practices" for non-point source control; however, at the present time under existing legislation no funds are available.
7. No response necessary.



STATE OF UTAH-DEPARTMENT OF SOCIAL SERVICES

LYMAN J. OLSEN, M.D., M.P.H.
Director of Health

DIVISION OF HEALTH
44 MEDICAL DRIVE
SALT LAKE CITY, UTAH 84113
AREA CODE 801
533-6146
June 9, 1976

GALVIN L. RANFORD
Governor
PAUL S. ROSE
Executive Director

Board of Health
Air Conservation Committee
Health Facilities Council
Medical Examiner Committee
Nursing Home Advisory Council
Water Pollution Committee

Environmental Health Services Branch
72 East 4th South
Salt Lake City, Utah

RECEIVED

JUN 11 1976

OFFICE OF REGIONAL
ADMINISTRATION

Mr. John A. Green
Regional Administrator
Environmental Protection Agency
1860 Lincoln Street
Denver, Colorado 80203

Re: Draft Environmental Impact Statement
for Utah Lake-Jordan River Water
Quality Management Planning Study

Dear Mr. Green:

We have reviewed the Draft Environmental Impact Statement (D.E.I.S.) and the Summary Draft Environmental Impact Statement (S.D.E.I.S.) for the Utah Lake-Jordan River Water Quality Management Planning Study. Our review of this information has raised serious questions as to the real intent and purpose of such a statement, which we always assumed is to assess the detailed environmental impacts of the recommended management plan developed in the original two year study of the Jordan River Basin.

1 It appears that the document goes far beyond this purpose because a major portion is devoted to a rehash of the alternatives originally considered in the study. This certainly does not seem the time nor the method for any objections or criticism of the recommendations of the original study since they should have been voiced and resolved at the time of original submittal. We are bothered also by the additional time and money which has been spent on this endeavor since it has been rechecked in portions of the study at least four times by separate efforts.

2 As re-evaluation of the technical aspects of this plan under the disguise of an E.I.S. is particularly untimely in view the fact that the implementation is already proceeding and the study is being used as a base for ongoing 208 studies. Also from the review of the E.I.S. document, it is obvious that your consultants were unable to spend sufficient time here in Utah to really become as familiar with the local situation as the other consultants who have reviewed the Basin Plan. This is particularly disconcerting since there are numerous misconceptions presented and many ideas which are central to the main issues were not presented in any detail.

Our specific comments on the Draft Environmental Impact Statement (DEIS) and Summary (SDEIS) are as follows:

1. One area of major importance in the original plan which is hardly mentioned and definitely not evaluated in the E.I.S. is Utah's philosophy of an acceptable health risk when treated domestic wastewater is discharged to an uncontrolled environment.

3 Utah, like many other states including California, and individuals in the field of sanitary engineering recognizes a need for treatment beyond the secondary level as defined by EPA to reduce the health risks associated with discharging domestic wastewater. After much careful consideration and research of both economic and health aspects the Utah Water Pollution Committee and the Utah State Board of Health adopted a minimum effluent standard to be effective June 30, 1980 of level III treatment which could consist of adequate secondary treatment including granular media filtration and chlorination. The standard principally required total and fecal coliforms to be reduced to 200 and 20 organisms per 100 ml respectively. Also, since chlorination is more effective at low BOD and TSS levels, standards for these parameters were set at 10 mg/l. With these processes a significant reduction of virus is also expected.

4 The establishment of acceptable health protection will be one of the most significant impacts of implementing the recommended plan for the Jordan River Basin, yet this factor was hardly addressed in the E.I.S. when evaluating the impacts of various alternatives.

5 There are several places in the E.I.S. (SDEIS page 40; DEIS page 317) where it is indicated that EPA has determined that secondary treatment (as defined by EPA) is adequate for health protection when water quality standards are not violated. At the present time we have not seen a formal statement of this concept from EPA and we question whether this is a national policy since we are advised that EPA, Region IX, has been funding similar treatment projects in California based solely upon consideration of virus removal and health protection.

6 The above statement also seems contradictory to the original overall goals of the act. Furthermore, the intent of EPA to drop bacterial limitations from effluent standards may disclose a lack of interest in or knowledge of health protection measures which has to be a serious concern to Utah because of our statutory responsibility to protect health.

2. There appear to be some serious inconsistencies and misconceptions presented in table III-4, page 77 of the DEIS and figure 7, page 13 of the SDEIS.

7 According to the unit process diagrams shown on the above pages, level I treatment has been defined as "secondary treatment". However, the expected effluent capability to be achieved by level I, as shown in the table, clearly does not meet the secondary treatment definition as defined by EPA or the State of Utah.

This discredits the estimated costs of "secondary treatment" as compared to level III treatment since they are based on changing to level III from something less than secondary.

The above mentioned unit process diagrams are further misleading since they have been drawn to imply a completely separate unit process for nitrification. This is certainly not intended and can be verified by checking the process diagrams in the original Basin Plan (page 11-14). The nitrification obtained from level II effluent is merely that which occurs from proper operation of a conventional secondary treatment plant as required by Utah.

8 The above mentioned tables also show a different expected effluent quality for level III and level IV treatment from that presented in the original basin plan. The data presented indicates that the estimated suspended solids achievable for level III and level IV are 15 and 10 mg/l respectively instead of 10 and 5 mg/l as presented in the original plan. There is no justification given for increasing the anticipated SS levels. Therefore we do not agree that these numbers should be adjusted upward or feel that the bulk of the data available today would justify such a change.

9 3. We question the approach, objectivity and accuracy of the cost comparisons presented in this E.I.S. as well as whether this task rightly belongs in a document which is to assess the environmental impacts of a previously selected plan.

10 The costs are generally presented on a per capita basis. It should be clearly pointed out that these amounts will not be the actual amount requested from the local population since they will be greatly reduced by 75% funding of the eligible costs.

Since no real cost breakdowns were included with the DEIS we are concerned with the accuracy of these figures and the relative difference between the previously defined secondary treatment (level I) and level III treatment.

The results of these cost comparisons indicated that the previously defined secondary treatment costs varied between 35% and 55% of the level III costs.

A more meaningful cost comparison would be between secondary treatment to meet State and EPA standards (level II) and level III, (polished secondary) treatment for the various alternatives developed in the original plan. According to the detailed cost estimates of consultants presently working on these plans the incremental increase in cost for the entire basin to provide level III treatment in addition to adequate secondary treatment amounts to only about 20% of the total project cost. As an additional check using the EPA technical report "Cost Effective Wastewater Treatment Systems" the associated level III costs are equal to approximately 25% of the total project cost.

It seems readily apparent to us that level III (polished secondary) is economically achievable in Utah and also an essential step at this time to keep Utah moving toward necessary water pollution control accomplishments not inflated as a result of unreasonable and improper delays.

4. In the SDEIS, Page 12, there is a comparison made between Utah's coliform requirements for stream and effluent standards and EPA's present requirements. It is also indicated that EPA is considering dropping their effluent requirements for coliform in lieu of a disinfection requirements which meets water quality standards.

12 Utah's requirements call for stringent coliform limitations for sewage effluent and somewhat less strict requirements in the receiving water. These standards take into account the need for greater restriction of coliforms in effluents known to contain large numbers of human pathogens since the health risks associated with this type discharge are more significant than those encountered in a stream environment where the coliforms may have been introduced from cattle and other non-human sources.

13 5. On page 27 of the SDEIS it is stated that with I/I reduction future waste flows in Wasatch County will be less than at present. We question this statement since there appear to be no moves at the present to limit development. There are many very large developments in the planning stages including Mayflower Mountain and Silverwood development.

14 6. On page 28 of the SDEIS it is stated that Deer Creek Reservoir is a source of raw water supply for Provo. This is not the case; however, it is a source of supply for Salt Lake City and a potential source for Orem and Provo.

15 7. Page 28 of the SDEIS indicates that construction of new regional plant facilities will require more land for expansion. This is true; however, it should be noted that the additional land required would be less than that needed to upgrade and expand all existing facilities in place.

8. Regarding alternative no. 2 on page 42 of the SDEIS concerning implementation of the Jordan River Plan, there are some serious drawbacks which need to be addressed.

16 Requiring municipalities and sanitation districts to upgrade to secondary treatment now, and in a few years upgrade to level III, is not a cost effective approach to achieving the overall water quality goals. In addition this would greatly hinder the momentum required to get a project moving if they can only accomplish half the job now and will be required to take additional steps in the near future.

17 9. On page 247 and 248 the costs of implementing the recommended plan at secondary treatment for Wasatch County have been shown to be zero on the basis of the assumption that infiltration reduction and growth limitations would make it unnecessary to do anything to the existing plants.

We disagree with this reasoning since there appears to be tremendous growth potential for Heber Valley and even with a reduction in flow, the Heber treatment plant would require substantial modification to produce a consistently acceptable effluent.

10. The analysis on page 133 of the DEIS of the effect of treated effluents on the Great Salt Lake and Farmington Bay is greatly oversimplified and does not accurately portray the complexities of the environmental impact of these effluents on either the fresh water or the saline ecosystems.

STATEMENT: "A direct effect of Great Salt Lake's high salinity content is to kill most bacteria hence reducing the potential for oxygen depletion and health hazards." This statement does not take into account the fact that these effluents present a possible health hazard in the streams and marsh areas before they even get to the lake. Secondly, the above statement does not take into account the fact that because the fresh effluents are considerably less dense than the concentrated brines of the Great Salt Lake, "fresh water lenses" form on the surface of the lake water and can be detected at times great distances out on the surface of the lake. Pathogens in this fresh water are not killed by the lake water until mixing occurs, this gives rise to the possibility of infection to the increasing number of recreational enthusiasts on the lake.

18

STATEMENT: "Additionally, there is a limited algal population to assimilate nutrients, thus aesthetic problems associated with algal blooms and subsequent oxygen depletion may be limited." Even though the numbers of species of algae is limited by the high salt content of the lake, the actual biomass or the total amount of decomposable matter in the water can be extremely high. The numbers of the algae *Dunaliella* alone have been counted in excess of 300 million organisms/liter. The Great Salt Lake is a biologically productive body of water and the potential for aesthetic and health problems must not be underestimated.

STATEMENT: "Natural wave action in Great Salt Lake has created a sand barrier which effectively cuts off Farmington Bay from the remainder of the Lake." The structure which in effect isolated Farmington Bay from the remainder of the Great Salt Lake is the seven mile long causeway out to the northern tip of Antelope Island - not the sand barrier which temporarily in late 1975 formed across the 50 foot opening as a result of wave action. The freshening action in Farmington Bay began with the construction of the causeway and has continued irrespective of the condition of the small opening in the causeway.

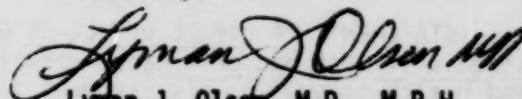
It is obvious that efforts to protect public health and water quality on the Great Salt Lake must be taken as seriously as on other bodies of water. The lake cannot be considered for use as a waste dump.

Mr. John A. Green
Page 6
June 9, 1976

In summary, we feel that there are many places in this E.I.S. where the data are presented in such a way that only part of the impacts of implementing a given alternative are clearly demonstrated.

The above comments represent a general summary of our evaluation of this draft and it is hoped that these thoughts will be factored into the final report.

Sincerely,



Lyman J. Olsen, M.D., M.P.H.
Director of Health

DAO:mc

RESPONSE TO UTAH DIVISION OF HEALTH

1. The delineation and environmental analyses of all feasible alternatives are required by the National Environmental Policy Act of 1969 and EPA's Final Regulations for Preparation of Environmental Impact Statements published in the Federal Register, 14 April 1975. Therefore, all alternatives originally considered in the Utah Lake-Jordan River Water Quality Management Planning Study were evaluated in the Draft EIS.
2. EPA regrets that the Division of Health feels that insufficient time was spent in Utah to become familiar with the local situation. We believe considerable effort was made to coordinate with interested parties including the Division of Health and the 208 Planning Agencies in the Study Area. Your attention is called to CHAPTER I of this document for the details of local participation. The following responses to specific comments contained in the Utah Division of Health's letter will hopefully clear up any misconceptions contained in the Draft EIS.
3. EPA's programs and policies are strongly oriented toward the protection of public health. The Agency supports all reasonable attempts to diminish public health risks. However, research on the economic and health aspects of treatment beyond the secondary level to reduce health risks is inconclusive. The National Academy of Science was unable to establish a definite relationship between coliform levels and health hazards. Furthermore, EPA supports Utah's initiative requiring Level III (polished secondary) treatment and thus EPA's position is clearly delineated in CHAPTER XII of this document.
4. EPA agrees that the establishment of acceptable health protection is a significant aspect of the proposed plan and should not be minimized. However, the relationship of public health protection to coliform concentration either in the treatment plant effluent or in the stream is not simple nor clearly defined. Regardless, EPA supports Utah's initiative to prescribe Level III treatment for protection of public health as well as for achievement of water quality standards. EPA's position on Level III treatment is discussed in more detail in CHAPTER XII.
5. We believe the statements that you refer to are contained in CHAPTER XII of the Draft EIS and in SECTION 14 of the Summary. The exact statement is, "In accordance with the Federal Water Pollution Control Act, EPA has determined that these National secondary treatment requirements are adequate for treatment of domestic wastewater, if water quality standards are not violated by the effluent discharged." Regarding this statement, the Water Pollution Control Act states under Section 301(b)(2)(B) that, "In order to carry out the objective

of this Act there shall be achieved - not later than July 1, 1983, compliance by all publicly owned treatment works with the requirements set forth in Section 201(g)(2)(A) of this Act." Section 201 (g)(2)(A) requires the application of the best practicable waste treatment technology. In October, 1975, EPA published a document entitled, "Alternative Waste Management Techniques for Best Practicable Waste Treatment" which set forth criteria for the application of such treatment. It is stated in this document that, "Publicly-owned treatment works employing treatment and discharge into navigable waters shall, as a minimum, achieve the degree of treatment attainable by the application of secondary treatment...". It is further specified that, "Requirements for additional treatment ... will depend on ... availability of cost-effective technology, cost, and the specific characteristics of the affected receiving water body." This document further discusses land application practices as possible measures to achieve this treatment technology but does not establish a uniform requirement beyond secondary treatment. Instead treatment beyond the secondary level is to be established on an individual basis considering such items as mentioned above. This is the basis for the statement in the EIS. However, we recognize that this brief statement may be misinterpreted and it has been removed for the final document.

Regarding projects in California, our understanding is that projects which are being funded by EPA, Region IX, which include filtration, activated carbon, or other treatment devices beyond conventional secondary treatment are justified on a case-by-case basis, considering such factors as cost-effectiveness, water use, flow variation, and stream standards. This approach is consistent with the established criteria for best practicable waste treatment and is the same as EPA's, Region VIII, policy as discussed in CHAPTER XII.

6. EPA recognizes the point made in the first sentence of this paragraph, however, a discussion of whether EPA's administrative decision is contradictory to the original goal of the Act is beyond the scope of this EIS. We believe, at this time, EPA's definition of best practicable waste treatment technology is very responsive to the overall goals of the Act.

EPA's programs and policies are strongly oriented towards the protection of public health. In the proposed regulation which would drop fecal coliform effluent standards in favor of establishing coliform effluent limits to meet ambient water quality standards, it is noted that, "Public health and protection of the aquatic and human environments are still the overriding considerations...". These regulations are proposed to limit the uncontrolled and excessive uses of chlorine for wastewater disinfection, decrease unwarranted costs of operating facilities, and decrease the energy consumption

in manufacturing chlorine. Under these proposed regulations, proper disinfection and control of fecal coliforms in wastewater treatment facilities will still be required to meet water quality standards.

7. This unit process diagram has been deleted for this and other reasons as indicated in your comments. Estimated costs for secondary treatment presented in the Draft EIS are not based on Level I treatment as presented in the Draft EIS. Costs for secondary treatment were based on EPA secondary treatment requirements published in 40 CFR 133 and Cost-Effective Wastewater Treatment Systems, U. S. Environmental Protection Agency, Washington, D. C. 20460, July 1975.

The unit process diagram illustrated in Table III-4 of the Draft EIS and Figure 7 of the Summary are not intended to represent nitrification as a separate unit process. The diagram has been removed from this figure so as not to imply a separate unit process for biological nitrification. We recognize biological nitrification can be achieved successfully as part of the biological oxidation process; however, the longer detention time to accomplish nitrification requires larger capacities, thus, the addition of biological nitrification increases capital and operating costs. In costing conventional secondary and Level III (polished secondary) treatment, the difference in unit processes was assumed to be the addition of an extended aeration unit, which will achieve biological nitrification, and filtration for Level III. Expansion of existing facilities, through addition of trickling filter or activated sludge units, to provide treatment of projected 1995 flows was assumed for secondary treatment.

The same basic procedure was also utilized in costing new facilities. Although these assumptions may not be exactly what is proposed by an individual facility plan, this procedure is reasonable for achievement of the effluent limitations required for EPA's secondary treatment and Utah's Level III treatment. These costs are not to substitute for detailed cost estimates but to be used for comparative purposes only. A more detailed explanation of this costing procedure is given in a task report entitled, "Development of Water Quality Impacts" which is available for review upon request.

8. You are correct. The estimated effluent quality for TSS for Levels III and IV treatment presented in Table III-4 of the Draft EIS and Figure 7 of the Summary were incorrect. The values for Level III and IV TSS have been changed to 10 mg/l and 5 mg/l, respectively. Due to the very significant non-point TSS contributions this change does not alter any of the environmental impact analysis.
9. EPA's regulations for preparation of environmental impact statements require a, " ... comparative evaluation of the environmental impacts commitments of resources, costs and risks of the proposed action and each feasible alternative."

10. We agree. The text of the draft statement indicates that these costs are not actual costs and do not recognize the potential for 75 percent Federal funding for capital costs. We have added further clarification of these costs in each cost table contained in this Final EIS.
11. EPA's definition of secondary treatment, not Level I, was used to estimate costs for secondary treatment facilities in the Draft EIS. These costs together with cost estimates for Level III and Level IV treatment were developed from Cost-Effective Wastewater Treatment Systems, U. S. Environmental Protection Agency, Washington, D. C., July 1975. These costs are in terms of total 1973 capital (construction) costs, annual operation and maintenance costs, and total annual cost per person connected to the system. They represent only preliminary cost estimates and need to be refined as each individual facility plan is developed. They are used herein only to provide a comparative base between alternatives. The total annual cost per person is not intended to reflect actual costs for persons connected to the system as they do not account for the potential of 75 percent Federal funding. (See response to Item 10.)

Differences between the cost estimates for secondary treatment (EPA definition) and those for Level III and Level IV are specific to each alternative and reflect the need for upgrading, expansion, biological nitrification, filtration, etc. See response to Item 7 for a general description of the procedure used to estimate costs and for reference which gives more detailed information.

12. Section 510 of the Federal Water Pollution Control Act allows Utah to adopt and enforce more stringent effluent requirements than established Nationwide by EPA.
13. Future wastewater flows in Wasatch County were based on future population projections as presented in the Plan. If future development occurs as predicted and infiltration/inflow controls are implemented, it is possible future wastewater flows will be less than present. However, if future growth exceeds the projections contained in the Basin Plan, waste loads will be greater thus requiring additional wastewater treatment capacity.
14. This correction has been made in the Final EIS.
15. EPA agrees and the text has been altered accordingly.
16. CHAPTER XII of the Final EIS recognizes the possible problems with implementation of the Basin Plan's recommendations in accordance with Alternative 2 described in the Draft EIS. However, the requirement that secondary treatment be achieved at all public owned treatment works by July, 1977, and with the limited Federal funds presently available for this purpose, EPA has no choice but to prioritize funding in the manner described in CHAPTER XII.

17. See response to Item 13 above.
18. We appreciate these comments and changes and additions to the referenced text have been made to reflect these comments concerning the Great Salt Lake and Farmington Bay issue. No inference to the use of Great Salt Lake as a "waste dump" was ever intended. The ongoing 208 Programs are currently analyzing this very complex issue.

THE UNIVERSITY OF UTAH

SALT LAKE CITY 84112

DEPARTMENT OF
CIVIL ENGINEERING
3012 MERRILL ENGINEERING BUILDING

9 June 1976

RECEIVED	INITIALS/DATE

Mr. John A. Green
Regional Administrator
U. S. Environmental Protection Agency - Region VIII
1860 Lincoln Street
Denver, Colorado 80203

Re: Comments on draft EIS for Utah Lake -
Jordan River Water Quality Management
Planning Study

Dear Mr. Green:

It is our opinion that your consultants and agency personnel generally covered the issues relative to an appropriate analysis of the environmental impact of the recommendations contained in the Utah Lake - Jordan River Water Quality Management report. Nonetheless, we believe there are some significant misconceptions and misrepresentations contained in the EIS. Ordinarily these probably would not be subject to comment, but under the circumstances they could have substantial impacts on future water pollution control programs in Salt Lake County and the State of Utah.

1 First of all, we believe it is worthwhile mentioning that the State of Utah (through the Division of Health and the Utah Water Pollution Control Committee) anticipated expanded recreational uses of the State's surface waters. These anticipated uses are adequately and appropriately reflected in the existing Class C standards, which in many cases, admittedly do not represent existing conditions and may be difficult to achieve in the future. Nonetheless, these standards represent suitable and adequate goals for the State's water pollution control programs.

2 The State has adopted both total coliform and fecal coliform standards which are based on historical evidence of acceptable levels of pollution, particularly with respect to water contact activities. The implication of your EIS is that there is no need for standards such as the State has set, but rather, that EPA is pushing for a level of disinfection which will meet applicable water quality standards. This is a noble objective, but one has to question whether or not there is adequate information available to assure adequate protection of public health, unless there are continuous sufficient measurements of suitable indicator organisms. Inasmuch as many of the surface waters of Salt Lake County are being used for water contact recreation, we are extremely concerned about the importance of addressing the public health issues. We believe your EIS is totally deficient in this regard.

3 Related to the public health issue is the matter of treatment plant operational reliability. With standard secondary treatment there is very little one can do to assure that plant upsets do not result in improperly and inadequately disinfected effluent discharges. In this regard it makes a great deal of sense to consider polished secondary as the minimum acceptable level of treatment, so as to be reasonably assured of consistently achieving secondary wastewater quality. Yet the question of operational reliability is not addressed in the EIS.

4 The topic of nonpoint pollution repeatedly appears in your EIS. We agree that nonpoint pollution is a significant factor and must be adequately addressed in any comprehensive water quality management program. A sizeable portion of our 208 effort is being addressed to this problem. In fact, one of the first tasks in our 208 Project (prior to the commencement of the work on this draft EIS) was to obtain a reliable estimate as to the impacts of nonpoint pollution on Salt Lake County's major water resources. We notified your representatives that this information would be available for review, but they neither called nor met with us on this subject. In fact, the statement is made in your summary report that "estimated nonpoint pollution loadings...are not based on the information being developed by these 208 agencies". Is there a defensible reason that your consultants and agency personnel elected not to use this information?

5 One of the major goals of the Salt Lake County 208 Project is to provide adequate water quality for the Jordan River Parkway project. Most of our considerations are based on major existing and/or anticipated uses of these water resources including the water contact sports of swimming, fishing, boating, etc. We have looked hard at the water quality requirements to support these beneficial uses. Our analyses clearly demonstrate the need for polished secondary treatment, as one element of the comprehensive water quality management program, particularly during the critical summer months when we experience low flows (hence low dilution factors) in the Jordan River. We recognize that we may not be able to achieve six milligrams per liter of dissolved oxygen at all times in the Jordan River, but we can safely provide for many recreational uses including the propagation of many species of fish. Your report implies that the development of a cold water fishery in the Jordan River will be an impossibility (and therefore, indirectly questions a positive water pollution control program in the Jordan River watershed). It seems almost elementary to point out that there are many fisheries besides those designated as "cold water". Furthermore, there are some rather negative comments concerning bottom substrate conditions and the resultant aquatic habitat in the Jordan River. Again, we must point out that we have a very positive comprehensive water quality management program ongoing, and we are in the process of addressing these very important issues. Your report seems to imply that these factors are being neglected.

6 A most significant factor which was omitted in your EIS is the participation of the U. S. Army Corps of Engineers in the Jordan River Parkway project, which is being sponsored by the Provo-Jordan River Parkway Authority under the direction of Mr. Vee Call. The Corps of Engineers have done considerable work in developing an adequate flood control/storm water control program for the lower Jordan River, and we anticipate that similar efforts will continue in some of the upstream reaches. The Corps of Engineers have worked closely with the Salt Lake County 208 Project, in order to ensure that their efforts are compatible

Mr. John A. Green
9 June 1976

-3-

with the most recent conclusions and recommendations of the 208 Project. We anticipate that the Corps of Engineers stormwater control program will result in substantial reductions of nonpoint pollution reaching the Jordan River through the existing stormwater sewers. This information has been available for some time, and more recent analyses conducted in the Salt Lake County 208 Project have provided updated insights into feasible control programs. Why wasn't this information used in the EIS?

7 In conclusion, we wish to reemphasize the fact that Salt Lake County, in conjunction with the Utah Division of Health has consistently demonstrated a progressive program of water pollution control. One contemporary element is planning for adequate wastewater treatment to provide for existing and anticipated receiving water for beneficial uses. We have worked closely with other federal agencies such as the U. S. Army Corps of Engineers, and we have had an excellent relationship with your 208 Program personnel. This EIS does not meet our expectations based on these other contacts. The implications and deficiencies in concepts, plans, or programs (particularly with respect to nonpoint pollution control) are unjustified. We are well pleased with our 208 efforts and believe they should have been included in the EIS analysis.

Sincerely,

DW Eckhoff

David W. Eckhoff, Ph.D., P.E.
Project Director

DWE/mh

cc: Mr. Max Dodson
Utah 208 Coordinator
USEPA - Region VIII

Mr. Lynn Thatcher
Deputy Director
Utah Division of Health

RESPONSE TO DAVID W. ECKHOFF, SALT LAKE COUNTY 208 PROJECT DIRECTOR

1. EPA agrees.
2. EPA programs and policies are oriented toward protection of public health. The Agency supports all reasonable attempts to diminish public health risks. However, research on the economic and health aspects of treatment beyond the secondary level to reduce health risks is inconclusive. The National Academy of Science was unable to establish a definite relationship between coliform levels and health hazards. EPA's dropping of fecal coliform effluent limitations in favor of a requirement that stream standards be met will not affect Utah's requirements where they are more stringent.
3. EPA agrees that proper operation of a wastewater treatment facility is of utmost importance in maintaining effluent integrity and water quality goals. In this regard Level III (polished secondary) treatment can be an added safety factor, but it is not intended that additional treatment substitute for proper operational and maintenance practices. EPA's position on Level III treatment is delineated in CHAPTER XII of the Final EIS.
4. EPA acknowledged in the Draft EIS that the ongoing 208 Programs were developing reliable estimates of the impacts of non-point sources of pollution. However, this information was not available at the time the analysis was performed for the Draft EIS. Because of this, the non-point source analysis presented in the Draft EIS was based on information contained in the original study.
5. It was not intended to question the ongoing water pollution control program for the Jordan River because of the difficulty of meeting water quality standards for cold water fisheries. The State of Utah has classified the Jordan River from approximately the Jordan Narrows north as a cold water fishery (Class CC) with a minimum DO concentration of 6.0 mg/l. As indicated in the Draft EIS, if a warm water fishery is desired, then Class CW with a minimum DO requirement of 5.5 mg/l should be required. Again, statements in the Final EIS regarding meeting cold water fishery standards in the Jordan River are not in any way intended to reflect negatively upon the very positive aspects of the ongoing water pollution control programs.
6. EPA recognizes the significant work that the Salt Lake County 208 has done with the U. S. Army Corps of Engineers in conjunction with the proposed Jordan River floodway project. Unfortunately, this EIS cannot address both the Utah Lake-Jordan River Water Quality Management Plan and the 208 Plan as it is now evolving. For this reason,

EPA has not covered this floodway project other than to recognize the potential beneficial relationship of the Water Quality Management Plan and the ongoing 208 planning efforts to this Corps/Parkway Authority project (see CHAPTER VII, RELATIONSHIP TO OTHER FEDERAL, STATE, AND LOCAL PROGRAMS).

7. Because this EIS effort was started not long after the 208 study started, it was not possible to include in the EIS analysis many 208 study efforts which are now well along. As you know members of EPA met with the 208 personnel and the 208 Directors were included in the EIS Advisory Committee in an effort not to duplicate the 208 study efforts.

THE LEAGUE OF WOMEN VOTERS OF UTAH

211 East Third South, Rm. 200
Salt Lake City, Utah 84111
Phone: 328-4532

June 10, 1976

UTAH LAKE-JORDAN RIVER WATER QUALITY MANAGEMENT STUDY, EIS HEARING

I am Jan Miller, speaking for the League of Women Voters of Utah. The League has long supported the idea of basin-wide water quality planning in order to make the best use of our resources.

1 Our primary concern with the plans for up-grading sewage treatment plants as recommended in the Utah Lake-Jordan River Water Quality Management Planning Study is the effect on land use patterns which will result from construction of extensive collector lines to regional treatment plants. The development of lands adjacent to the collector lines is not always compatible with master plans developed by the counties, nor with the expressed desire of citizens to maintain agricultural areas within Wasatch, Utah, and Salt Lake Counties. The land use impacts will be smallest in Salt Lake County where much development has already occurred. We urge that the 208 studies now underway carefully study minimization of urban sprawl through location of collector lines.

2 On the policy question of funding priorities, the League urges EPA to proceed with all possible speed in funding Level III treatment in Utah. We commend EPA for its efforts to clean up non-point source pollution and we urge the Utah Division of Environmental Health to proceed as fast as possible in this direction. In a semi-arid state such as Utah, the effluent from treatment plants may empty into dry streambeds for many months of the year, and secondary treatment is not adequate to safeguard public health under these circumstances.

3 We believe that the Federal Water Pollution Control Act provides a great opportunity for gathering basic data on our natural resources. We urge that these studies - 303 and 208 - not be rushed. We sense an attitude on the part of public officials that the studies be completed as soon as possible in order that construction of treatment plants may begin.

4 The brevity of the section on public participation (page 4) may be an indication of how little meaningful participation there was. We feel citizens should be given more background information on specific goals and alternatives to accomplish the purpose of the project.

We have long recognized the need to improve sewage disposal and clean up our waterways, but we believe that data collection and sensible planning now will reduce the need for major expenses in coming years.

RESPONSE TO THE LEAGUE OF WOMEN VOTERS OF UTAH

1. The impact of interceptors and regional wastewater treatment facilities as they affect growth and development is covered in CHAPTER V, LAND RESOURCE IMPACTS of the Final EIS. EPA recognizes local desires to protect agriculture and other land uses and supports the adherence to local land use goals and objectives as summarized in the EIS through local land use management. Additionally, each 201 Plan will include an environmental review in accordance with NEPA. This review will provide an opportunity to assure the minimization of adverse land use impacts resulting from construction of a wastewater treatment system. This review can best be accomplished in conjunction with the facility planning process because much more specific information is available on the land use implications of the proposed plan.
2. See CHAPTER XII, COURSE OF ACTION.
3. While EPA has the responsibility to achieving the goal of the Federal Water Pollution Control Act by specified dates, EPA has no intention of rushing the planning process at the expense of sound water quality management.
4. Additional efforts were made in conjunction with this EIS to provide for greater public participation. See the section on public participation in the Final EIS.

UNITED STATES DEPARTMENT OF AGRICULTURE

SOIL CONSERVATION SERVICE

4012 Federal Building, Salt Lake City, Utah 84138

June 23, 1976

Mr. John A. Green
Regional Administrator
Region VIII
U.S. Environmental Protection Agency
1860 Lincoln Street
Denver, CO 80203

Dear Mr. Green:

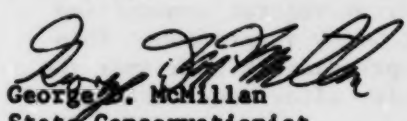
We have reviewed the draft Environmental Impact Statement for the Utah Lake-Jordan River Water Quality Management Planning Study and attended the June 10, 1976 public hearing on the draft EIS. The statement adequately covers the social and environmental settings of the area, the project alternatives for municipal waste water management, and the impacts of the waste water management alternatives on water, land, resource, and air quality.

1 [The title of the draft Environmental Impact Statement conveys the idea that all aspects of water quality management within the project area are included, but the document is keyed mainly to municipal waste water treatment and does not adequately cover non-point sources of pollution. The title should be changed to indicate that the planning study deals mainly with municipal waste water treatment.

2 [The statement would be strengthened by including a statement of the project purposes and goals in Chapter I, Introduction. The first sentence under Chapter XII, Alternative Courses of Action, on page 317 seems to be a clearer, concise statement of these purposes and goals.

Attached are a list of specific comments for your consideration in the preparation of the final Environmental Impact Statement. We appreciate the opportunity to review and comment on this draft Environmental Impact Statement.

Sincerely,


George D. McMillan
State Conservationist

Attachment



UNITED STATES DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

Comments on the Draft Environmental Impact Statement for
Utah Lake-Jordan River Water Quality Management Planning Study

- 3 [1. An unnecessarily large portion of the EIS is devoted to the description of the proposed action and to the existing environment. Also, the most significant environmental impacts should be ranked and analyzed in depth.
- 4 [2. The soils write-up in the environmental setting section is inaccurate and poorly written. There is no discussion of suitability or limitations of the soils for installation of treatment plants, etc.
- 5 [3. There is no discussion regarding provisions for erosion control and water management during construction of waste water treatment facilities or for conservation treatment on the project lands, rights-of-way, access roads, etc.
- 6 [4. There is no discussion of the effects of project installation on the disruption of natural drainage patterns for the effects of water discharge from project lands on erosion and water quality.
- 7 [5. There is no discussion of the impacts of project installation on existing conservation systems or provisions for protecting existing systems.
- 8 [6. There is no indication of the kinds and amounts of prime agricultural land or other significant land and water resource areas which would be irreversibly or irretrievably lost.
- 9 [7. There is no discussion of the impact of severance of farmland or other significant land and water resource areas.
- 10 [8. There is no discussion of the impact of the proposed action on wetlands.
- 11 [9. There is no provisions for stockpiling, conserving or properly disposing of topsoil. For example, on page 239, the next to the last sentence under Item B, indicates there may be a long term impact resulting from elimination of natural intolerant vegetal communities and the introduction of undesirable tolerant weedy vegetation. This can be avoided by stockpiling topsoil then spreading it back over the disturbed areas and seeding with proper species after construction.
- 12 [10. Chapter VII, entitled Relationship to Other Federal, State and Local Programs, does not include any discussion of the Soil Conservation District Programs of applying conservation land treatment measures on cropland to prevent erosion and sedimentation. These programs have a tremendous impact on non-point sources of pollution. Also, there is no mention of the work being done by the model cities program in cleaning up the Jordan River area.

- 13 [11. The statement does not indicate significant effects of the proposed action on fish and wildlife habitat, rare and endangered plant and animal species or historical and archeological sites, nor is there any discussion as to whether or not the proposed action threatens or alters any property included in or eligible for inclusion in the National Register of Historic Places.
- 14 [12. The percentages in Figure II-3 on page 15 total to more than 100 percent.
- 15 [13. Is there evidence to support the listing of wild turkey with the other upland game on page 32. Also, on page 33 ponderosa pine does not occur within the area being considered.
- 16 [14. The irrigation diversions listed on page 35 total to 160,000 acre-feet while the figure listed on page 33 is 150,000.
- 17 [15. In the table on page 74, the column titled Silviculture would be better designated as range and woodland. Silviculture applies to trees and a large part of the area included does not have trees. The same comment applies on the top of page 76.
- 18 [16. The statement on page 145 that the fish population from 7800 South to the Great Salt Lake consists entirely of rough fish is incorrect. There are game fish caught as far north as Second South.
- 19 [17. On page 167 the statement that algal blooms are nuisance aquatic growths is not entirely true. Under controlled or managed conditions some forms of algal blooms can be beneficial both to the fish and in controlling growth of other aquatic plants.
- 20 [18. The term disrupt is used repeatedly throughout the statement. This term does not describe whether the impact is temporary or permanent or whether the effect is such that it will be possible to reclaim the area to its former use.
- 21 [19. The statement on page 22, paragraph four, the second sentence, that Figure II-8 shows seismic activity occurs along the boundary between the basin and range province and the Colorado Plateau-Middle Rocky Mountain provinces is not consistent with the map. The map does not show seismic activity, only approximate fault locations. Also, the yellow block in the map legend reads "Area underlain by thick sequences" but there is no indication of what these sequences are. Is this referring to Lake Bonneville sediments, alluvial deposits, sedimentary rock, or what?

RESPONSE TO SOIL CONSERVATION SERVICE

1. The title of the Draft EIS is based on the title of the original planning study. Non-point sources of pollution were not significantly addressed in the planning study, but some effort was expended in evaluating the impact of non-point sources in the Draft EIS.
2. Regarding a statement of the project purposes and goals, the Description of Action of page iii has been changed to reflect this concern.
3. There are a total of 60 alternative wastewater treatment schemes presented in the planning study. The complexities created by such a large number of alternative courses of action required a detailed documentation of the proposed action. The Study Area covers more than two million acres, hence the description of the existing environment required expansive documentation. However, approximately 35 percent of the Draft EIS is devoted to the discussion of existing environment and the project alternatives, the remaining portion being used to present the analysis of impacts. Significant environmental impacts were ranked and explained in CHAPTERS IV, V, and VI.
4. The EIS was developed to emphasize regional impacts as opposed to site-specific conditions. Given the extent of the plan, it is impossible to address specific soil conditions at each treatment plant site. Soils are given much greater consideration in the individual facility plans.
5. A discussion of erosion control is contained in CHAPTER IX, MITIGATING MEASURES of the EIS. Further recommendations, as required, will be forthcoming as part of the facilities planning process.
6. See response to Item 5 above.
7. See response to Item 5 above. Also, CHAPTER IX, MITIGATING MEASURES contains such provisions.
8. A tabulation of the amount of current and projected irrigated and non-irrigated agricultural land in each Planning Area is presented in Tables III-2 and III-3. The total net loss of farmland is estimated to be 32,114 acres by 1995.
9. EPA is uncertain of the meaning of this comment, but the loss of agricultural and other lands is explained in Item 8.
10. The impact of the proposed action on wetlands is presented in Table V-7. For example, Alternatives CUC-7, 8, and 9 are expected to impact shoreline marshland around Utah Lake because of the proposed

interceptor in that area. Because the exact location of that interceptor has not yet been determined, further consideration is not possible at this time.

11. EPA recognizes the need for stockpiling topsoils. This and other mitigating measures are presented in CHAPTER IX.
12. EPA recognizes the work performed by the SCS in applying conservation land treatment measures on cropland to reduce non-point sources of pollution. CHAPTER VII has been revised accordingly.
13. Significant effects of the proposed action on fish and wildlife habitat, rare and endangered plant and animal species, and historical and archeological sites are presented in CHAPTER V under TERRESTRIAL ECOSYSTEM IMPACTS beginning on page 233. Also see the response to the U. S. Department of the Interior, Item 13.
14. The percentages in Figure II-3 were taken from the original plan which did not sum to 100 percent. They have been adjusted accordingly.
15. The reference to wild turkey has been deleted from the EIS. The reference to Ponderosa pine was taken from the Central Utah Project Bonneville Unit Final Environmental Statement, Bureau of Reclamation, August 1973.
16. This correction has been made in the Final EIS.
17. This change has been made in the Final EIS.
18. The text has been changed to reflect this comment.
19. The text has been changed to reflect this comment.
20. The term disrupt used in CHAPTER V and in such Tables as Table V-8 is intended to infer long-term impacts over the life of the project because these are secondary impacts resulting from development.
21. The reference to seismic activity in the Draft EIS has been changed to reflect this comment. Additionally, the area underlain by thick sequences illustrated in Figure II-8 is intended to convey a variety of sediments including Lake Bonneville sediment in the western sector of the Study Area, alluvial deposits around the mouths of major streams, and volcanic formation in the mountains.



THE IZAAK WALTON LEAGUE OF AMERICA

INCORPORATED

5013 1st Grade
Salt Lake City, Utah 84117
June 22, 1976

United States E.P.A.
1860 Lincoln Street
Denver, Colorado 80203

Gentlemen:

The Izaak Walton League of America would like to make our feelings known on the Utah Lake-Jordan River Water Quality Management Plan as follows:

1- Davis County: We recommend Plan "B" as outlined in the Environmental Impact Statement.

2- Salt Lake County: We support the recommended plan to abandon all the treatment plants except Salt Lake suburban #1 and the Salt Lake City Plants, however the discharge should be channeled into the Great Salt Lake. If it is diverted into Jordan River the treatment should be at least 4. This plan in our opinion would have the least Environmental and Economic impact.

3- Northern and Central Utah County:

We support the recommended treatment plans.

4- Wasatch County: We support the recommended plan, however the new plant should be treatment level 4. We think this would protect the drinking water for Salt Lake City.

We like the second Basic Alternative policy and feel it has much merit. It would put funds and high water quality where it is most needed. We hope the plan will not be influenced by political pressures.

We think all plans should reflect treatment level 3 or better. The controls on the Valley water must upgrade the quality of Utah Lake and the Jordan River. These waters must be both swimmable and fishable.

You are to be congratulated on your draft E.I. S. It is one of the most informative we have ever read. Thank you for allowing us the opportunity to express our views.

Sincerely,

Dwight H. McGarry
Dwight H. McGarry, Nat'l Director
Izaak League of America



February 11, 1976

Dear Salt Lake City-County Citizens:

The Izaak Walton League of America, with other civic minded organizations in northern Utah, has adopted the Jordan River as a SAVE OUR STREAMS 'SOS' project this centennial year and future years.

When our pioneers came to the valley, the river was a thing of beauty and joy. Fishing and swimming was common. We do not think this natural resource should be wasted. What can we do today? What happened to the beauty and value once there? The Jordan River has too long been viewed as the discharge pipe for Utah and Salt Lake County's waste. This must be stopped. A study showed the river can be cleaned and restored to it's former beauty. We can have and must insist on fishable and swimmable water in the Jordan River.

Think of the advantages of a clean river. Besides raising real estate values and providing aesthetic enjoyment, there is swimming, boating, fishing, hiking, bicycling, and picnicking along it's banks. Before any of this pollution clean-up can be meaningful, much of it the responsibility of industry and sewage districts along the banks, they are doing their part; much litter and debris lines the river and this physical garbage needs to be cleaned up! Who will do it if we do not?

Specifically, what you can do is: 1) Be certain you do not add to the problem by dumping anything in or along the Jordan River, and 2) take your family, scout troops, or other groups to the river to help clean it up, and then contact the County or City, depending on the area you clean, to pick up the debris at the nearest bridge crossing.

Contact the Izaak Walton League (266-5408), Trout Unlimited (277-1149), or other civic groups about questions you have or what you can do to help. THANK YOU.

RESPONSE TO THE IZAAK WALTON LEAGUE OF AMERICA

1. EPA's decision on the alternative policies regarding Level III and IV treatment is presented in CHAPTER XII of the Final EIS.



by Ansel Adams in *This is the American Earth*

SIERRA CLUB

Mills Tower, San Francisco 94104

July 2, 1976

Mr. John A. Green
Regional Administrator
U. S. Environmental Protection Agency
1860 Lincoln
Denver, Colorado 80203

Dear Mr. Green: Draft Environmental Impact Statement for
Utah Lake-Jordan River Water Quality
Management Planning Study

1 We are writing to request that hearings be held on the draft statement in Utah and Wasatch Counties. It is imperative that the public be informed as to the proposed alternatives which have been proposed by the 208 Study Team. To our knowledge the draft statement has not been discussed in the local press. The public needs to be informed about the plans in local hearings which have not been held. Many of the proposals for sewage collection are extremely controversial and the local citizens may not be willing to pay for the proposals.

2 Even though Mountainlands claims in the enclosed brochure to have an advisory committee, they have not released the citizens' names. The Environmental Protection Agency is not adequately involving the public or the state agencies. For the welfare of all concerned we want a change in policy.

Thank you for your consideration of this problem. We look forward to hearing from you.

Sincerely,

John P. Moellmer
JOHN MOELLMER, Ch.
Temp. Group--
Utah Chapter

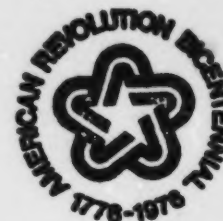
RESPONSE TO SIERRA CLUB

1. A public hearing was held on June 10, 1976, in Salt Lake City. The transcript of that hearing is presented at the end of this Chapter. We regret that you may not have been able to attend either the afternoon or evening sessions of this hearing or that you may not have known about the hearing. Several different attempts were made to notify the public about the hearing including a notice sent out with the Draft EIS, an official announcement placed in the Salt Lake Tribune and Deseret News, and a press release which did result in at least one story in the Salt Lake Tribune.
2. Regarding the 208 studies, EPA requires substantial public involvement in development of the 208 plan. However, this EIS is not intended to directly cover any of the 208 plans in the area, as they are still being developed. Rather, this EIS evaluates the environmental, social and economic implications of the Utah Lake-Jordan River Water Quality Management Planning Study which deals mainly with the upgrading and regionalization of existing wastewater facilities along with the provision of new regional facilities within these hydrologic basins. The 208 studies will undoubtedly draw upon this Basin Plan but will also be developing more specific recommendations and investigating additional water quality management issues. Public hearings will be held in conjunction with these 208 studies (Mountainlands 208, Salt Lake County 208, and Weber River 208) in addition to the public involvement process now occurring.



United States Department of the Interior
OFFICE OF THE SECRETARY

MISSOURI BASIN REGION
DENVER, COLORADO 80225



In reply refer to:
ER 76/476

JUL 7 1976

Dear Mr. Green:

This responds to your May 14, 1976, letter requesting the Department of the Interior's review and comment on the draft Environmental Impact Statement for Utah Lake-Jordan River Water Quality Management Planning Study, Utah.

General Comments

1 The draft Environmental Impact Statement could be improved by adding a map of the total study area that identifies the recommended plan and its relationship to recreation resources; i.e., the Jordan River Parkway. This kind of map could be prepared for each county. The maps as presented (Figures V-1 through V-23) in the draft statement do not provide adequate information to determine the impacts the project may have on recreation resources.

2 As indicated on page 295 of the Environmental Statement, the Bureau of Reclamation is currently planning water development projects on the Provo River, Jordan River, Utah Lake, and in the Diamond Fork area. The Department of the Interior is concerned with water quality aspects of development caused by such projects and shares with the Environmental Protection Agency (EPA) the concern for identifying point and nonpoint sources of pollution. Currently, the Bureau of Reclamation has initiated a water quality sampling program in the Bonneville and Uinta Basins to gather baseline water quality data on various tributaries upon which project features will be located. This program includes supplemental funding to the ongoing Mountainlands Section 208 water quality studies. We believe that data being formulated and assessed through EPA efforts will form the basis of Reclamation's water quality management program and will assist in properly assessing existing water quality conditions and predicting impacts of the Central Utah Project on water quality.

Specific Comments

II. Background

Environmental Setting

Figure II-8 fails to show the active Warm Springs fault despite its proximity to the Salt Lake City and other treatment plants. In addition, a comparison of Figures II-8 and II-2 reveals that seven other existing or proposed treatment facilities are on or near active fault zones. While the statement reveals that "Faulting . . . is of concern . . ." (p. 22), it does not give any indication of how great the concern is. The Wasatch fault zone has recorded 103 earthquakes between 1850 and 1963. The Governor's Conference on Geologic Hazards, held in December 1967, documented eight earthquakes in or near the study area having an inferred measurement of 3.0 or greater on the Richter scale.

- 3 In an area so seismically active, special consideration should be given to all building designs and locations, especially for such projects of great importance to public welfare.

Soil tests should be conducted on all proposed treatment plant sites, the results to be used in selecting plant locations. The statement should also outline what design modifications should be incorporated in existing and proposed structures to make them earthquake-safe. The cost of these modifications should be included in determinations of economic impacts as well. All such considerations should be discussed in the statement so the public can know that the agencies involved are aware of the threat posed by earthquakes and have acted accordingly.

- 4 The comment on page 35 concerning Utah Lake flow regulation should be modified to indicate that flows into the Jordan River are not regulated in high runoff years.

- 5 The fifth sentence on page 36 should be modified to read: "The remaining 45 percent is being discharged naturally to the Jordan River and the Great Salt Lake and to the shallow water table by upward leakage."

III. Project Alternatives

- 6 Discussion of alternatives DC-5, DC-6, DC-9, DC-10, DC-11, DC-12, DC-13, SLC-7, and SLC-8 should be expanded. These alternatives involve changes in points of discharge of plant effluents which have made up part of the water supply to valuable waterfowl production areas in the Farmington Bay area. Some analysis should be made of the impact of the reduction of water supply.

7 [According to page 102, a plant exists to collect Wallsburg wastewater and convey it to Provo by means of a proposed Provo Canyon interceptor. We are concerned with the pollution potential of a raw sewage pipeline in Provo Canyon below Deer Creek. This reach of the Provo River delivers water for municipal use in Salt Lake County and eventually into Utah County.

The alternatives in treating Wallsburg sewage should be carefully considered. Has the alternative for a Wallsburg-to-Charleston treatment plan been considered along with associated tradeoffs?

8 [Paragraph 2 of page 113 indicates that plans for expansion of the existing Provo facility "would seem to preclude consideration" of the overall Utah and Wasatch County alternatives. We suggest that further explanation of why these alternatives were ruled out be added to the text.

IV. Water Quality Impacts

9 [The effects of overloads on wastewater treatment facilities resulting from stormwater runoff carried by sanitary sewer interceptors should be assessed in the Environmental Statement. An assessment is needed to adequately evaluate water quality impacts associated with subarea alternatives proposed for municipal systems (p. 119).

V. Land Resource Impacts

10 [An appropriate statement should be included concerning any proposed management scheme for disposal of wastewater treatment sludge (p. 193).

11 [Some discussion concerning the long-term impacts of the project on recreation potentials would be desirable; for example, identification of recreation trails that may be incorporated with the interceptor lines or use of such right-of-way as an access to formerly inaccessible recreation resources. The Utah State Comprehensive Outdoor Recreation Plan identifies urban hiking trails, bicycle paths, and urban horseback riding trails in the Salt Lake City-Provo areas as high-priority needs. The incorporation of such recreation facilities into the planning effort of this project should be considered.

12

Treatment plants within defined floodplains would be under the risk of flood unless protective measures are taken. Careful consideration would be given to expansion of treatment plants in the floodplain areas.

The statement should reflect consultation with the National Register of Historic Places and should discuss whether any National Register properties will be affected. If the project has an effect on a National Register listing, the statement should reflect further compliance with Section 106 of the National Historic Preservation Act of 1966 (P.L. 89-665).

The statement does not clearly confirm consultation with the State Historic Preservation Officer for the state involved. He is Mr. Milton L. Weillenmann, Executive Director, Department of Development Services, Salt Lake City, Utah 84114. The final Environmental Statement should reflect that he was consulted to determine whether the proposal will affect any cultural site that may be in the process of nomination to the National Register of Historic Places and should contain a copy of his response.

According to NPS, pages 234 to 237 of this document do not adequately relate to historical or archaeological sites within the designated study area that could be adversely affected by the proposed wastewater treatment facilities. Page 234 includes the statement, although there is no reference to any archaeological surveys having been made, "Archaeological sites occur throughout the entire region." Table V-7 on the pages immediately following includes the statement: "Interceptor may disrupt archaeological site." This is repeated several times.

The final Environmental Impact Statement should clarify the source of these statements. Moreover, it should identify what the referenced archaeological sites are, present a professional opinion as to their significance, establish which alternatives are preferred, and state what will be the impact of proposed developments upon known cultural resource sites.

Accordingly, in order to satisfy requirements of Sections 1(3), 2(a), and 2(b) of Executive Order 11593, prior to preparation of the final Environmental Impact Statement, the Environmental Protection Agency should arrange for surveys of all lands within the project area where water quality management may result in ground-disturbing activities.

13

These surveys should be conducted by a professional archaeologist and a professional architectural historian. The results of the surveys should be fully detailed in the final Environmental Impact Statement along with specific comments and recommendations of the principal investigators.

The final Environmental Impact Statement should also include specific guidelines for immediate notification of the State Historic Preservation Officer, evaluation by a professional archaeologist, and excavation, if warranted, in the event that previously unknown sites are located during project construction. However, it should be recognized that the recovery of archaeological resources from a project area after construction has commenced is considered at best to be a last resort when no alternate mitigative action to protect the resource "in situ" is possible.

Any sites or structures which may qualify for inclusion on the National Register of Historic Places and which will be affected in any way by the proposed project, including visually or aesthetically, should, in consultation with the State Historic Preservation Officer, be evaluated in the final Environmental Impact Statement. This is in accordance to the Advisory Council on Historic Preservation "Procedures for the Protection of Historic and Cultural Properties" (36 CFR, Part 800).

VII. Relationship to Other Federal, State, and Local Programs

14 Delete "illustrated in Figure VII-1" in the first sentence of page 295, and insert after "Bonneville Unit" in the second sentence.

The second paragraph of page 297 should be deleted since it is not a part of the Bonneville Unit.

VIII. Unavoidable Adverse Impacts

15 Potential water-right problems and their relationship to regionalization is briefly mentioned. The regionalization plan may influence water rights involving the Central Utah Project. This possibility should be investigated and further addressed.

Summary Draft Environmental Statement

7. Water Quality Management

16 It should be pointed out that Deer Creek Reservoir does not provide a water supply for Provo; Deer Creek Reservoir water is utilized in Salt Lake County. Provo City does exchange Deer Creek storage water for water from springs in the lower South Fork.

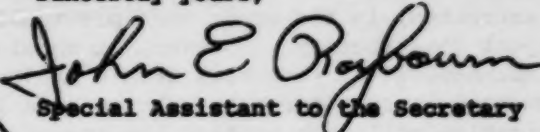
9. Land Use

17

The spelling of "Nehi" on page 30 should be changed to "Lehi" in the discussion of northern Utah County.

The spelling of "with" on page 31 should be changed to read "within" in the discussion of Wasatch County.

Sincerely yours,

for 
Special Assistant to the Secretary

Mr. John A. Green
Regional Administrator
U.S. Environmental Protection Agency
Region VIII
1860 Lincoln Street
Denver, CO 80203

RESPONSE TO U. S. DEPARTMENT OF THE INTERIOR

1. The original plan established a regional approach to wastewater treatment. Accordingly, the EIS documents the examination of regional implications of the wastewater management alternatives and recommended plans. Because of the limited information contained in the plan relating to location of new treatment facilities and interceptors, it was impossible to examine in detail the site specific impacts other than those presented in the EIS. Site specific impacts, including effects on recreational resources will be addressed in the environmental assessment section of each 201 facilities plan. At that time a determination of significant and/or controversial issues will be accomplished and a facility plan environmental impact statement developed if required. EPA believes that project site impacts on specific recreational and other resources can be best addressed by this approach.
2. EPA supports and recognizes that additional water quality and other information is being developed which will greatly enhance ongoing water quality and water resource planning efforts within the Study Area.
3. The location of the Warm Springs fault has been added to Figure II-8. EPA agrees that special consideration should be given to the design and location of wastewater treatment plants and interceptor sewer lines in this area. EPA will review the facility plan environmental assessments to determine the extent to which an earthquake hazard exists for each individual plan. EPA may require consultation by the engineer with the Utah Geologic Survey in those cases where significant earthquake hazards exist. The results of such consultation will be utilized in determining location and special design consideration. Soil tests, where not previously conducted, are a normal part of the engineering required to develop treatment plant designs and specifications.
4. The statement on page 35 concerning Utah Lake flow regulation has been modified to reflect the lack of flow regulation into the Jordan River in high runoff years.
5. The statement on page 36 regarding groundwater discharges has been modified accordingly.
6. At the present time, the wastewater effluents from three Davis County treatment facilities are ultimately discharged to Farmington Bay. Effluent from the North Davis facility reaches the Bay through an open ditch. Central Davis effluent is discharged to Farmington

Bay via a sewage canal. The South Davis-North plant discharges to a Jordan River diversion canal leading to the Farmington Bay Bird Refuge. The effluents pass through marshland which support viable aquatic and wildlife communities. The flow of wastewater and the nutrients in the wastewater have played a role in sustaining the marshlands. Any proposed wastewater treatment alternative which reduces the nutrient loading through increased treatment or relocation of the discharge may deprive the marsh ecosystem of needed nutrients and/or flow. However, it is impossible to determine the level of disruption of the ecosystem without more intensive investigations. All alternatives would reduce any health hazards associated with recreation in the Farmington Bay area.

North Davis Wastewater Treatment Facility

In the case of the North Davis facility, Alternatives DC-1, 2 (Recommended Plan A), and Recommended Plan B would decrease potential nutrient loadings through increased treatment, but the projected discharge of 17.5 MGD would still flow through the open ditch. Alternatives DC-3, 4, and 7 to 13 would reduce potential nutrient loadings through increased treatment but would also move the discharge from this treatment plant of 17.5 MGD directly to the Bay thereby reducing flow to surrounding marshland. In Alternatives DC-5 and 6, flows from the North Davis facility would be increased to 21.6 MGD because of the abandonment of the Central Davis facility and rerouting to North Davis, but both alternatives include Bay outfalls thus depriving the marshes of possibly needed nutrients and flow.

Central Davis Wastewater Treatment Facility

Alternatives DC-1, 2 (Recommended Plan A), and Recommended Plan B would also decrease potential nutrient loadings in the Central Davis discharge area through increased treatment. The projected Central Davis flow of 4.1 MGD would still be available to the marshland through the sewage canal. Alternatives DC-3, 4, 7, 8, 10, 11, 12, and 13 all require additional treatment and Bay discharges, thereby eliminating both nutrients and a projected Central Davis discharge of 4.1 MGD from availability to marshlands in the area. Alternative DC-9 would have a similar impact even though flow at Central Davis would be increased by 9.9 MGD because of the abandonment of the South Davis North and South facilities and rerouting to Central Davis. Alternative DC-9 includes a Bay discharge. Alternatives DC-5 and DC-6 also would deprive marshlands of potentially needed nutrients and flow because Central Davis would be rerouted to North Davis.

South Davis North Wastewater Treatment Facility

The existing South Davis North effluent supplies nutrients and flow to the Farmington Bay Bird Refuge. Alternatives DC-1 through 6, 10, and 11 would reduce potential nutrients through increased

treatment, but the projected South Davis North discharge of 6.9 MGD would still reach the Refuge. Alternatives DC-7, 8, and Recommended Plan B present a unique situation in that projected flow would be increased to 9.9 MGD with the abandonment of the South Davis South facility and potential nutrients would increase despite further treatment because of the increased flow and maintenance of the existing discharge location. Alternatives DC-9, 12, and 13 would deprive the Refuge of potential nutrients and flow because of the abandonment of the South Davis North facility.

7. Regarding the proposed Provo Canyon interceptor, EPA has received a request for a grant to plan for wastewater treatment and collection within Provo Canyon including Wallsburg. One alternative previously studied is an interceptor through Provo Canyon possibly connecting to the Provo wastewater treatment facility. Other alternatives exist and EPA shares the Department of the Interior's concern about water quality and other environmental implications of this project. All feasible alternatives must be carefully considered during the planning stage. In all probability an environmental impact statement will be required prior to a final decision on this project.
8. The text has been changed to reflect the comment on Overall Utah and Wasatch County alternatives and the planned expansion of the Provo facility.
9. Using average 1974 flow data and available data on current design capacities, the following treatment facilities in the Study Area are perceived to be hydraulically overloaded:
 - . Cottonwood
 - . Tri-Community
 - . Sandy
 - . Lehi
 - . American Fork
 - . Heber
 - . Spanish Fork
 - . Salem

Additionally, the Granger-Hunter and Salt Lake Suburban No. 1 treatment facilities have 1974 average flows in excess of 90 percent of design capacity, indicating a high potential for hydraulic overloading during peak flow periods. However, these conditions will be resolved by implementation of the plan and subsequent 201 facility plans and, hence, is not considered to be a resulting water quality impact of the plan.

10. Proposed management schemes for the disposal of wastewater treatment sludges were not specifically addressed in the plan. However, sludge management will be an integral part of each 201 plan and will be addressed as part of the environmental assessment.

11. EPA supports multiple uses of interceptor rights-of-way and treatment plant sites, including recreational uses. However, EPA grant funds are not available for directly supporting the development of multiple use sites.
12. With regard to the flood plain issue as it relates to treatment plant siting, reference is made to the section entitled, Flood Hazards on page 233 of CHAPTER V.
13. A new section entitled Archaeological and Historical Resources has been added to the text in CHAPTER V. It is impossible to determine at this time, given the level of detail presented in the Plan, if any direct impacts to sites listed on the National Register of Historic Places will occur as a result of Plan Implementation. Consultation with the State Historic Preservation Office occurred several times during the process of developing the Draft EIS, resulting in the letters presented in this Chapter from Mr. John Smith and Mr. Milton Weilenmann.

The statements that "Interceptor may disrupt archaeological sites" have been explained in the Final EIS.

Because exact locations of new treatment plants and interceptor sewer lines are not given in the Plan but will be determined in the 201 facilities planning process, it is impossible to determine for certain if conflicts exist with known sites or to even survey a particular site for evidence until such sites and corridors are preliminarily located. EPA does not believe a survey of the general regions in which facilities may be located to be a practical method of determining if conflicts exist between archaeological and historical resources and wastewater facilities. Rather, a survey, if needed, should be conducted on a site, preliminarily selected for construction of a wastewater treatment or collection works. Site selection occurs during the 201 wastewater facilities planning process.

EPA, Region VIII, is presently in the process of developing guidelines for compliance with the appropriate laws and regulation regarding the preservation and restoration of archaeological and historical resources. These guidelines will be oriented towards assuring proper consideration of cultural resource during the individual facilities planning stage. Once finalized these guidelines will specify procedures for:

- 1) Determining if a conflict exists between proposed wastewater facilities and any site listed in the National Register of Historic Places.
- 2) Requiring a site survey by a professional archaeologist if there exists a reasonable expectation of an archaeological find.
- 3) Considering an alternate location of the wastewater facility or specifying construction requirements for recovery of cultural resources if an archaeological or historical resource conflict exists.

- 4) All of the above done in consultation with the State Historic Preservation Officer and when necessary formalized with the Advisory Council on Historic Preservation.
14. The reference to Figure VII-1 and the Bonneville Unit of the Central Utah Project has been changed in the Final EIS. Additionally, the reference to Argenta Reservoir has been deleted from the Final EIS.
15. More detailed analyses of water rights issues than presented in the EIS is impossible for this regional level of planning. Specific water rights issues will be addressed during the 201 facilities planning process. The EIS includes recommendations of remedial actions once the specific issues have been identified.
16. The reference to Deer Creek Reservoir and the Provo water supply has been changed in the Final EIS.
17. Spelling corrections have been made in the SUMMARY.

TED WILSON
MAYOR
222-7704

DUAINE RASMUSSEN
ADMINISTRATIVE ASSISTANT

SHANNA SANFORD
SPECIAL ASSISTANT



JOHN GUST
PARKS SUPERINTENDENT
FRED J. DIANA
BUDGET DIRECTOR

July 13, 1976

United States Environmental
Protection Agency
Region VIII
1860 Lincoln Street
Denver, Colorado 80203

Gentlemen:

Recently the draft environmental impact statement for the Utah Lake - Jordan River Water Quality Management Planning Study was submitted to us for review and comments. Mr. Vernon F. Jorgensen, our City Planning Director, is directly responsible for reviewing such documents and filing comments with the Board of Commissioners. I have enclosed a letter to the Board of Commissioners from Mr. Jorgensen explaining the staff analysis of the environmental impact statement. I would appreciate your including Mr. Jorgensen's analysis in your record as you deliberate over the impact statement.

If you have any questions on the matter, please contact me.

Best regards,

A handwritten signature in dark ink, appearing to read "Ted L. Wilson". The signature is fluid and cursive, with a long, sweeping underline that extends to the right.

Ted L. Wilson
Mayor

/rst

TED L. WILSON, MAYOR
CHAIRMAN
VERNON F. JORGENSEN
PLANNING DIRECTOR
MILDRED G. SNIDER
SECRETARY
EX-OFFICIO MEMBERS:
JOSEPH S. FENTON
CITY ENGINEER



MEI 78:
RICHARD C. ANDREW
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HOWELL Q. CANNON
A. EARL DAVIS
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MRS. DEAN H. LEE
ROBERT LEWIS
C. CASH RAMPTON
F. DAVID STANLEY
SECOND VICE CHAIRMAN

June 28, 1976

Honorable Mayor and
Board of City Commissioners
City & County Building
Salt Lake City, Utah 84111

Gentlemen:

- 1 [As requested I have reviewed the "Draft Environmental Impact Statement for Utah Lake-Jordan River Water Quality Management Planning Study". The E.I.S. seems deficient in several categories. In my opinion, it does not properly address the use of surface waters for recreational purposes. It seems to ignore the large amount of information being generated by the 208 Water Quality Study in the non-point sources of pollution. It also seems deficient in the needs and impacts of the Jordan River Parkway Project.
- 2 [I question the cost comparison in the E.I.S. and feel that they should be reevaluated, and possibly presented in a more meaningful way, perhaps as a comparison between secondary treatment to meet state and E.P.A. standards (level II) and level III (polished secondary) treated by the various alternatives developed in the original plan.
- 3 [The analysis of the effect of treated effluent on Great Salt Lake seems over simplified and does not present the real problem in this area. However, my major criticism would be the seeming lack of input from the 208 study into this report.

Respectfully,


Vernon F. Jorgensen
Planning Director

VFJ:ty

RESPONSE TO SALT LAKE CITY CORPORATION

1. Both the EIS and original Plan address attainment of water quality standards which were established by the Utah Division of Health for the achievement and maintenance of beneficial uses including recreation. Site specific impacts on recreational resources were not addressed in any great detail in the EIS because of the limited information contained in the Plan relating to location of new treatment facilities and interceptors. For further information see Item 1 in RESPONSE TO U. S. DEPARTMENT OF THE INTERIOR.

EPA acknowledges that the ongoing 208 Programs are developing reliable estimates of the impacts of non-point sources of pollution. Because this information was not available at the time the analysis was performed for the Draft EIS, these estimates were not included (see Item 4, RESPONSE TO DAVID W. ECKHOFF, SALT LAKE COUNTY 208 PROJECT DIRECTOR).

EPA recognizes the potential beneficial relationship of the Plan and ongoing 208 Programs to the Jordan River Parkway Project. In this regard please see Item 1, RESPONSE TO CORPS OF ENGINEERS and Item 6, RESPONSE TO DAVID W. ECKHOFF, SALT LAKE COUNTY 208 PROJECT DIRECTOR.

2. EPA's definition of secondary treatment was used to compare costs between secondary treatment, Level III, and Level IV treatment. An explanation of this analysis is presented in Items 7 and 11, RESPONSE TO UTAH DIVISION OF HEALTH.
3. EPA recognizes that the impact of wastewater effluents on Farmington Bay and Great Salt Lake is greatly simplified, but this is caused by the limited information available at the time. Changes have been made to the text of the Final EIS to more precisely portray the impacts and to reflect comments made by the Utah Division of Health regarding this issue. The ongoing 208 Programs are currently analyzing this very complex issue.

UNITED STATES DEPARTMENT OF AGRICULTURE
FOREST SERVICE

Uinta National Forest
P.O. Box 1428
Provo, Utah 84601

2560
July 19, 1976



Mr. John Green
Regional Administrator
U. S. Environmental Protection Agency
Region VIII
1860 Lincoln Street
Denver, Colorado 80203

Dear Mr. Green:

Reference is made to your announcement concerning requests for comments on the Draft Environmental Impact Statement for the Utah Lake-Jordan River Water Quality Management Planning Study.

We apologize for our tardiness in this matter; however, we have just found the time to review the summary report as well as the document itself. If it is not too late, we offer the following comments for your consideration.

1. We are concerned with any proposed alternative which would disrupt the esthetic character of Provo Canyon. As the draft states on page 195, priority has been given to the use of this canyon for watershed and recreation purposes. Alternatives which significantly increase residential and commercial uses in this area distract from these purposes and are, in our opinion, undesirable. The Forest Service is responsible for control of wildfire in this area and such development can only increase the risks of such fires burning off the slopes above the canyon bottom.
2. We suggest that that section of the "pie" graph on page 17 labeled as Forest be revised to read "Forest and Rangelands" as only a small portion of these lands are tree covered with the larger part being vegetated with brush or grasslands.
3. It does not appear that the geologic time scale chart on page 21 adds any specific information concerning the planning area and it does not tie to the narrative. Therefore, we can see little reason for its inclusion.
4. Concerning the last paragraph on soils on page 24, the soils maps are for portions of these counties only, generally the valley areas, and do not cover the entire counties.

Page 2

- 5 [5. An apparent typographical error appears on Table II-2, page 30. The altitudinal limits of the subalpine ecosystem should obviously read 9,000 to 11,000 feet.
- 6 [6. Pages 53 through 68 were omitted from our copy of the draft statement, so we cannot comment on that section. However, we believe several mountain recreation sites deserve inclusion on the generalized land use maps on pages 72 and 73. We have penciled these sites, both existing and anticipated, on the enclosed photocopies of the subject hydrologic basins. Also, one important mining area has been added on the existing map at the Tintic Mine drain. These maps are also reproduced on page 7 of the summary report.
- 7 [7. The waste water treatment alternatives, Figures III-4 through III-9, are duplicated in Chapter IV in Figures IV-1 through IV-31. Surely reference to these figures could be made in the narrative of Chapter IV where needed and the draft could be shortened by 18 pages.
- 8 [8. On page 21, second paragraph, second column, the summary report states: "The American Fork River violates all Class C standards." We believe this sentence should read: "The Lower American Fork River Class C standards." The upper portion of this stream is a clear mountain stream of apparent high quality.
- 9 [9. On page 31, first paragraph, second column, the summary report states: "The long interceptor line required by this plan would pass through Provo Canyon which is presently undeveloped." Provo Canyon is rather intensively developed for recreation use, but is on the whole sparsely developed, not undeveloped.

We appreciate this opportunity to review this statement and wish you success in implementation of a plan which will best provide for improvement of water quality in this part of Utah.

Sincerely,

Bruce B. Hronek
for
BRUCE B. HRONEK
Forest Supervisor

Enclosures

RESPONSE TO U. S. NATIONAL FOREST SERVICE

1. The impact of growth and development in Provo Canyon caused by construction of an interceptor through the Canyon is discussed in CHAPTER V of the EIS. Certainly, increased use of the area for residential and commercial development or intensive recreation will increase the risks of man-caused fires and the subsequent effects of erosion, loss of habitat, etc. EPA has received a request for a grant for wastewater treatment and collection within Provo Canyon. All feasible alternatives will be carefully considered during the planning process. In all probability an environmental impact statement will be required prior to a final decision on this project.
2. This change has been made in the Final EIS.
3. Figure II-7, Geologic Time Scale is presented to assist the reader in understanding the time frame of the geologic discussion. The reference to the Figure is on page 19 which, unfortunately, was missing from the Draft EIS. This oversight was corrected in the Final EIS.
4. The reference to Figures II-9 to II-11 on page 24 has been changed to reflect this comment.
5. This correction has been made in the Final EIS.
6. These changes have been made in the Final EIS.
7. EPA felt it was necessary to include the referenced figures in both CHAPTER III and IV for clarity and to avoid undue searching by the reader while reading the text.
8. These changes have been made to the SUMMARY in the Final EIS.

WRITTEN COMMENTS RECEIVED
NOT REQUIRING A RESPONSE

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DEPARTMENT OF HEALTH, EDUCATION, AND WELFARE
REGION VIII
FEDERAL OFFICE BUILDING
19TH AND STOUT STREETS
DENVER, COLORADO 80202

June 2, 1976

OFFICE OF THE REGIONAL DIRECTOR

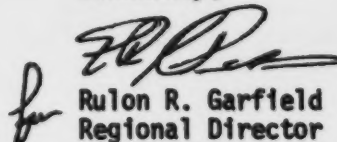
Mr. John A. Green
Regional Administrator
Environmental Protection Agency
1860 Lincoln Street
Denver, Colorado 80203

Dear Mr. Green:

Thank you for the opportunity to review the draft Environmental Impact Statement (EIS) for the Utah Lake--Jordan River Water Quality Management Planning Study.

It appears that the impacts expected to result from the proposed project and reasonable alternatives thereto have been adequately addressed.

Sincerely,


Rulon R. Garfield
Regional Director

cc: Office of Environmental Affairs, HEW,
Washington, D.C.
Council on Environmental Quality,
Washington, D.C. (2 copies)





DEPARTMENT OF HEALTH, EDUCATION, AND WELFARE

REGION VIII

FEDERAL OFFICE BUILDING
19TH AND STOUT STREETS
DENVER, COLORADO 80202

OFFICE OF THE REGIONAL DIRECTOR

June 2, 1976

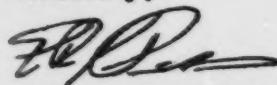
Mr. John A. Green
Regional Administrator
Environmental Protection Agency
1860 Lincoln Street
Denver, Colorado 80203

Dear Mr. Green:

Thank you for the opportunity to review the draft Environmental Impact Statement (EIS) for the Utah Lake--Jordan River Water Quality Management Planning Study.

It appears that the impacts expected to result from the proposed project and reasonable alternatives thereto have been adequately addressed.

Sincerely,


for Rulon R. Garfield
Regional Director

cc: Office of Environmental Affairs, HEW,
Washington, D.C.
Council on Environmental Quality,
Washington, D.C. (2 copies)





U.S. DEPARTMENT OF TRANSPORTATION
FEDERAL HIGHWAY ADMINISTRATION
REGION EIGHT

July 7, 1976

IN REPLY REFER TO:

08-00.21

Mr. John A. Green
Regional Administrator
Region VIII
U.S. Environmental Protection Agency
1860 Lincoln Street
Denver, Colorado 80203

Dear Mr. Green:

This office appreciates the opportunity to review the draft
Environmental Impact Statement for Utah - Lake Jordan River
Water Quality Management Planning Study.

We have no comments to offer concerning this statement.

Sincerely yours,

F. S. Allison, Director
Office of Environment and Design

Utah County Wildlife Federation



R.F.D.#1, Box 622
Payson, Utah 84651
July 9, 1976

United States Environmental Protection Agency
Attn. John A. Green, Regional Administrator
Region VIII
1860 Lincoln St.
Denver, Colo. 80203

Dear Mr. Green,

I have just recently been appointed chairman of the Water Quality Committee of the Utah Wildlife and Outdoor Recreation Federation, the organization representing the bulk of the nearly 300,000 sportsmen of the state of Utah.

In order to keep informed on the subject, I am in need of a copy of the Draft Environmental Impact Study for Utah Lake-Jordan River Water Management Planning Study, which was recently completed by your agency. I am unable to obtain this document from the Mountainlands Association of Governments.

Very Sincerely,

W.R. Phelps
W. R. Phelps, President
Utah County Wildlife Fed.
R.F.D.#1, Box 622
Payson, Utah 84651

FEDERAL REPORTING SERVICE
DENVER, COLORADO

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PROCEEDINGS

**PUBLIC HEARING ON DRAFT
ENVIRONMENTAL IMPACT STATEMENT
FOR UTAH LAKE-JORDAN RIVER WATER
QUALITY MANAGEMENT PLANNING STUDY**

**Suite A
Salt Palace
100 SW Temple
Salt Lake City, Utah**

Thursday, June 10, 1976

PARTICIPANTS:

JAMES W. SANDERSON, Regional Counsel, Environmental Protection Agency, Region VIII, Denver, Colorado, Chairman.

PATRICK A. CROTTY, Project Engineer, Environmental Protection Agency, Region VIII, Denver, Colorado.

J. ROBERT DOYLE, Environmental Engineer, Environmental Protection Agency, Region VIII, Denver, Colorado.

**FEDERAL REPORTING SERVICE
DENVER, COLORADO**

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FEDERAL REPORTING SERVICE
DENVER, COLORADO

PROCEEDINGS

2:05 p.m.

MR. SANDERSON: The hearing will come to order, please.

My name is Jim Sanderson. I am Counsel to the Region VIII Office of EPA in Denver.

On my left is Bob Doyle, Environmental Specialist. On my right is Pat Crotty, who is with our Construction Grants Program, Sanitary Engineering Specialist, and we are here today to receive public comments from anyone regarding the Draft Environmental Impact Study that the EPA has prepared for the Utah Lake-Jordan River Water Quality Management Planning Study which was prepared to address water quality and basically wastewater treatment problems in those basins.

The hearing is convening at approximately 2:00 p.m., June 10, 1976, at the Salt Palace in Salt Lake City, Utah. We will run this afternoon and hear from those who wish to speak, and then at 7:00 p.m. this evening, we will reconvene for those who found it inconvenient or who were unable to join us this afternoon, and we will adjourn at the end of that session.

For those of you who haven't filled out one of these cards when you came in the door, please do so, and you can indicate to Miss Trapp, our Legal Assistant, if you

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1 desire to make a statement and/or be placed on our mailing
2 list.

3 In a moment, I will ask Bob here to try and
4 summarize some of the issues that are involved in this study;
5 however, prior to that time, I just want to lay down kind of
6 a format that we are following today.

7 It is an informal legislative hearing-type format
8 with no rules of evidence, no adverseness in the nature of
9 an adjudicatory hearing will be followed. Rather, it will
10 be an informal give and take. When your name is called, if
11 you want to make a statement, just come forward to the
12 podium and deliver same, and the panel may ask a question
13 or may not, if something comes to mind that needs clarification.
14

15 After the close of the proceedings, the Region
16 VIII Office of EPA will finalize the Environmental Impact
17 Statement pursuant to the regulations under the National
18 Environmental Quality Act, and a final will be issued as soon
19 as possible, later this fall probably. If anybody here
20 either who makes a statement or who doesn't make a statement,
21 who after the proceedings something occurs to you and you
22 wish to make comments, just forward them to myself, Jim
23 Sanderson at the EPA Office in Denver, and the address is
24 1860 Lincoln Street in Denver, 80203, and we will entertain
25 those up until the end of June, say, July 1st.

1 Bob, I would like to ask you just to say a few
2 words and frame the issues, and then we will proceed.

3 MR. DOYLE: Okay; the EIS is an attempt to
4 evaluate the broad aspects of a 20-year water quality
5 management plan with heavy emphasis on structural wastewater
6 treatment devices to meet the goals of the Water Pollution
7 Control Act and the State efforts also.

8 Basically, the EIS is divided up into three impact
9 analysis categories, those of water resources, land resources,
10 and water quality, and within those categories, the issues
11 which I think are either addressed or somehow displayed in
12 the EIS, whether or not they are resolved or not, in some
13 cases depending on the amount of information available to
14 us, but basically we have looked at the relative contribution
15 of point and nonpoint sources of pollution of bodies of
16 water within the study area, that being the Jordan River-
17 Utah Lake Drainages, which include south of Provo, up to,
18 in the Heber Valley, and through the Salt Lake City area.
19 Also, this study area includes Davis County.

20 It also addresses the cost of the alternatives
21 that are displayed within the Plan, the original basin Plan
22 for the area which the EIS is written for including secondary
23 treatment requirements of EPA, and more stringent require-
24 ments referred to as Level III or polished secondary, and
25 Level IV of the State of Utah.

1 Also addressed generally is the equatic impacts of
2 these alternatives and the degree of treatment afforded and
3 very generally gives a discussion on the water right issues
4 as they pertain to regionalization of wastewater treatment
5 facilities.

6 The land issues involve essentially discovery of
7 direct or indirect impacts. Indirect being those that may
8 result as a result of land changes which are assumed by the
9 Plan, not assumed to be directly attributable to the Plan,
10 but at any rate, they are in the Plan, what's being planned
11 for.

12 Also, adjacent land uses of the wastewater
13 treatment plants that exist, and those that would be expanded
14 under the Plan. Impacts to the wildlife and vegetation
15 associated with either direct construction or development of
16 the land-use plan that is assumed, and then impacts to
17 archeological and historical resources.

18 Within the air quality section, there is a modeling
19 effort which was done for the EIS on carbon monoxide and
20 particulate concentrations in the Provo and Salt Lake City
21 Basins, respectively. This effort was essentially to look
22 at the relationship of the assumed land-use plan population
23 to the goals of EPA to meet air quality standards for this
24 Region.

25 In closing, the EIS does have some, has a very broad

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1 area to cover and quite a few topics, and some of the
2 information that we had to develop, the EIS is not complete
3 at the time. I believe there are ongoing efforts which
4 should be explained or at least disclosed, and those are the
5 State of Utah water quality planning efforts and the 208
6 efforts which will continue in this effort to assess the
7 water quality and costs and impacts of the various facilities
8 on a facility-by-facility basis. There will be public
9 hearings involved with these on an individual basis, and
10 there will be review within EPA for compliance with the
11 National Environmental Policy Act in each individual case.

12 With that, I will stop.

13 MR. SANDERSON: Thanks, Bob.

14 All right; as I indicated, we will proceed with
15 those who wish to comment on this study and the various
16 alternatives presented for treatment of wastewater. The
17 first individual to be called is Jan Miller. When you come
18 forward, please restate your name and give the spelling if
19 it is an unusual name, as well as your address, and if you
20 represent an organization, please so indicate.

21 MS. MILLER: I am Jan Miller, speaking for the
22 League of Women Voters of Utah. The League has long supported
23 the idea of basin-wide water quality planning in order to
24 make the best use of our resources.

25 Our primary concern with the plans for upgrading

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1 sewage treatment plants as recommended in the Utah Lake-
2 Jordan River Water Quality Management Planning Study is the
3 effect on land use patterns which will result from
4 construction of extensive sewer collector lines to regional
5 treatment plants. The development of lands adjacent to the
6 collector lines is not always compatible with master plans
7 developed by the counties, nor with the expressed desire of
8 citizens to maintain agricultural areas within Wasatch, Utah,
9 and Salt Lake Counties. The land-use impacts will be
10 smallest in Salt Lake County where much development has
11 already occurred, but we urge that the 208 studies now
12 underway carefully study minimization of urban sprawl through
13 location of collector lines.

14 On the policy question of funding priorities, the
15 League urges EPA to proceed with all possible speed in
16 funding Level III treatment in Utah. We commend EPA for
17 its efforts to clean up non-point source pollution and we
18 urge the Utah Division of Environmental Health to proceed as
19 fast as possible in this direction. But, in a semi-arid
20 state such as Utah, the effluent from treatment plants may
21 empty into dry streambeds for many months of the year, and
22 secondary treatment is not adequate to safeguard public
23 health under these circumstances.

24 We believe that the Federal Water Pollution Control
25 Act provides a great opportunity for gathering basic data on

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1 our natural resources. We urge that these studies, the 303
2 and 208, not be rushed. We sense an attitude on the part of
3 public officials that the studies be completed as soon as
4 possible in order that construction of treatment plants may
5 begin.

6 The brevity of the section on public participation
7 on Page 4 may be an indication of how little meaningful
8 participation there was. We feel that citizens should be
9 given more background information on specific goals and
10 alternatives to accomplish the purpose of the project.

11 Parenthetically, I might add, we have been very
12 impressed with the public participation section of the 208
13 section in Salt Lake County, and we might urge that that be
14 taken as some sort of model to be used at other times and
15 places.

16 We have long recognized the need to improve sewage
17 disposal and clean up our waterways, but we believe that
18 data collection and sensible planning will reduce the need
19 for major expenses in coming years.

20 Thank you.

21 MR. SANDERSON: Thank you very much.

22 The next individual is W. V. Call.

23 MR. CALL: I am W. V. Call, but I don't think I
24 need all that noise, do I?

25 We commend the -- I represent the Provo-Jordan

1 River Parkway Authority. We commend the EPA for the
2 tremendous amount of help they have given over the last
3 several years in the cleaning up of point sources of
4 pollution or recommendations for the point sources of
5 pollution and nonpoint sources of pollution for the Jordan
6 River Valley.

7 I have written a prepared statement, and it is on
8 its way. I presume it has been received by your office, and
9 my testimony is in that written statement. But, I do want
10 to augment it just a little.

11 We are concerned about your alternative courses
12 of action, Section 14. If I have read that as I think you
13 meant to write it, it is a rather negative statement
14 indicating that little value would be derived from spending
15 money on improving or upgrading our point sources of
16 pollution, and that little value probably cost-to-ratio
17 benefit value would not be worth the time, effort, or money.
18 If this is what you meant by that section, I wish you would
19 rewrite it, because I don't think the community will buy it.
20 We must clean up our sewer districts regardless of the cost.
21 The Provo-Jordan River Parkway Authority have a very, very
22 long-range plan of at least helping to control the nonpoint
23 sources of pollution by purchasing some of the land on both
24 sides of the river, I am speaking of the Jordan River, and
25 of purchasing land and thereby able to control agricultural

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1 pollution by actual ownership, fee-title ownership of the
2 land in that area. Of course, this will not be a rapid
3 thing. It will not be a thing that will happen as quickly
4 as your plans plan to be set in operation.

5 But, we would urge you to look at Section 14 again
6 because it is annoying to those of us who are determined to
7 clean up this river basin if you tell us we cannot clean it
8 up by upgrading the sewer, the wastewater treatment plants
9 that there is no value in that, then we don't have much to
10 work with, and I would urge you to look again at that
11 particular item.

12 I would urge you to establish a little more liaison
13 with the community. I was in attendance at the only meeting
14 that I know of that was called regarding this study, and
15 why there were some negative thoughts expressed, I think
16 those people were willing to work in the main with your
17 people. But, I think the negativism came out so strongly,
18 probably the engineering firm who did this study were a
19 little afraid to meet the public, and I don't think that
20 that is the reputation that we would like to maintain, and
21 I don't think it is what the people meant. I think they
22 merely wanted more input than they had had.

23 I would urge you to consider a little more public
24 input and redoing or re-evaluation of Section 14.

25 MR. SANDERSON: Thank you, sir, very much. Your

1 observations are duly noted.

2 The next individual is Ken Watson.

3 MR. WATSON: My name is Ken Watson. I am the
4 Deputy Project Manager for the Salt Lake County 208 Project
5 representing Dr. Eckhoff and the 208 staff.

6 In front of you is a letter that we would like to
7 enter into the record. It has already been sent to Mr. John
8 Green, Regional Administrator, U. S. Environmental Protection
9 Agency, Region VIII, in Colorado.

10 Dear Mr. Green: .

11 It is our opinion that your consultants and agency
12 personnel generally covered the issues relative to an
13 appropriate analysis of the environmental impact of the
14 recommendations contained in the Utah Lake-Jordan River Water
15 Quality Management report. Nonetheless, we believe there
16 are some significant misconceptions and, misrepresentations
17 contained in the EIS. Ordinarily these probably would not
18 be subject to comment, but under the circumstances, they have
19 substantial impacts on future water quality control programs
20 in Salt Lake County and the State of Utah.

21 First of all, we believe it is worthwhile mentioning
22 that the State of Utah, through the Division of Health and
23 the Utah Water Pollution Control Committee, anticipated
24 expanding the recreational uses of the State's surface waters.
25 These anticipated uses are adequately and appropriately

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1 reflected in the existing Class C standards, which in many
2 cases, admittedly do not represent existing conditions and
3 may be difficult to achieve in the future. Nonetheless, these
4 standards represent suitable and adequate goals for the State's
5 water pollution control programs.

6 The State has adopted both total coliform and fecal
7 coliform standards which are based on historical evidence of
8 acceptable levels of pollution, particularly with respect to
9 the water contact activities. The implication of your EIS is
10 that there is no need for standards such as the State has
11 set, but rather, the EPA is pushing for a level of disinfection
12 which may meet applicable water quality standards. This is
13 a noble objective, but one has to question whether or not
14 there is adequate information available to assure adequate
15 protection of the public health, unless there are continuous
16 sufficient measurements of suitable indicator organisms.
17 Inasmuch as many of the surface waters of Salt Lake County
18 are being used for water contact recreation, we are extremely
19 concerned about the importance of addressing the public
20 health issues. We believe your EIS is totally deficient in
21 this regard.

22 Relative to the public health issue is the matter
23 of treatment plant operational reliability. With standard
24 secondary treatment there is very little one can do to assure
25 that plant upsets do not result in an improperly and

1 inadequately disinfected effluent discharges. In this regard,
2 it makes a great deal of sense to consider polished secondary
3 as the minimum acceptable level of treatment, so as to be
4 reasonably assured of consistently achieving secondary waste-
5 water quality. Yet the question of operational reliability
6 is not addressed in the EIS.

7 The topic of nonpoint pollution repeatedly appears
8 in your EIS. We agree that nonpoint pollution is a signifi-
9 cant factor and must be adequately addressed in any compre-
10 hensive water quality management program. A sizeable portion
11 of our 208 effort is being addressed to this problem. In
12 fact, one of the first tasks in our 208 Project, prior to the
13 commencement of the work on this draft EIS, was to obtain a
14 reliable estimate as to the impacts of nonpoint pollution
15 on Salt Lake County's major water resources. We notified
16 your representatives that this information would be available
17 for review, but they neither called nor met with us on this
18 subject. In fact, the statement is made in your summary
19 report that "estimated nonpoint pollution loadings...are not
20 based on the information being developed by these 208 agencies."
21 Is there a defensible reason that your consultants and agency
22 personnel elected not to use this information?

23 One of the major goals of the Salt Lake County 208
24 Project is to provide adequate water quality for the Jordan
25 River Parkway project. Most of our considerations are based

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1 on major existing and/or anticipated uses of these water
2 resources including the water contact sports of swimming,
3 fishing, boating, et cetera. We have looked hard at the
4 water quality requirements to support these beneficial uses.
5 Our analyses clearly demonstrate the need for polished
6 secondary treatment, as one element of the comprehensive
7 water quality management program, particularly during the
8 critical summer months when we experience low flows, hence
9 low dilution factors, in the Jordan River. We recognize that
10 we may not be able to achieve six milligrams per liter of
11 dissolved oxygen at all times in the Jordan River, but we
12 can safely provide for many recreational uses including the
13 propagation of many species of fish. Your report implies
14 that the development of a cold water fishery in the Jordan
15 River will be an impossibility, and therefore, indirectly
16 questions a positive water pollution control program in the
17 Jordan River watershed. It seems almost elementary to point
18 out that there are many fisheries besides those designated
19 as "cold water." Furthermore, there are some rather negative
20 comments concerning bottom substrate conditions and the
21 resultant aquatic habitat in the Jordan River. Again, we
22 must point out that we have a very positive comprehensive
23 water quality management program ongoing, and we are in the
24 process of addressing these very important issues. Your
25 report seems to imply that these factors are being neglected.

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1 A most significant factor which was omitted in your
2 EIS is the participation of the U. S. Army Corps of Engineers
3 in the Jordan River Parkway project, which is being sponsored
4 by the Jordan River Parkway Authority under the direction of
5 Mr. Vee Call. The corps of Engineers have done considerable
6 work in developing an adequate flood control/storm water
7 control program for the lower Jordan River, and we anticipate
8 that similar efforts will continue in some of the upstream
9 reaches. The Corps of Engineers have worked closely with
10 the Salt Lake County 208 Project, in order to ensure that
11 their efforts are compatible with the most recent conclusions
12 and recommendations of the 208 Project. We anticipate that
13 the Corps of Engineers stormwater control program will result
14 in substantial reductions of nonpoint pollution reaching the
15 Jordan River through the existing stormwater sewers. This
16 information has been available for some time, and more recent
17 analyses conducted by the Salt Lake County 208 Project have
18 provided updated insights into feasible control programs.
19 Why wasn't this information used in the EIS?

20 In conclusion, we wish to reemphasize the fact that
21 Salt Lake County, in conjunction with the Utah Division of
22 Health has consistently demonstrated a progressive program
23 of water pollution control. One contemporary element is
24 planning for adequate wastewater treatment to provide for
25 existing and anticipated receiving water for beneficial uses.

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1 We have worked closely with other Federal agencies such as
2 the U. S. Army Corps of Engineers, and we have had an
3 excellent relationship with your 208 Program personnel. This
4 EIS does not meet our expectations based on these other
5 contacts. The implications and deficiencies in concepts,
6 plans, or programs, particularly with respect to nonpoint
7 pollution, are unjustified. We are well pleased with our
8 208 efforts and believe they should have been included in
9 the EIS analysis.

10 This is signed by Dr. Eckhoff, Ken Watson, and
11 Steve Jensen.

12 MR. SANDERSON: Thank you, Mr. Watson.

13 I think one observation I want to provide, on
14 normal occasions, we have to update the information in here,
15 and we sure are appreciative of your willingness to supply
16 all this information that you are gathering under the 208
17 Program.

18 MR. DOYLE: I just wanted to ask you for the
19 record, so that we can address one of your comments as to
20 when the nonpoint information that you referred to was not
21 coordinated, not contacted, we didn't contact you, when was
22 that available, if you can recall?

23 MR. WATSON: Our consultant, Hydrosience, out of
24 California, one of the first tasks of our 208 was to come
25 up with these nonpoint waste loads. To tell you exactly, it

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1 was within the fall of '75, within a month.

2 MR. DOYLE: October?

3 MR. WATSON: November, sometime around that time.

4 MR. SANDERSON: Thank you.

5 I have had no indication from anyone wishing to
6 present any kind of a statement up until now, is there anyone
7 else present who wishes to make a statement?

8 (Whereupon, there was an indication from the
9 audience.)

10 MR. SANDERSON: Sir, come forward.

11 MR. OSLER: My name is Don Osler, and I am
12 representing the Utah State Division of Health, Bureau of
13 Water Quality. I would like to present a letter into the
14 record which was signed June 9, 1976, by Dr. Lyman J. Olsen,
15 who is Director of Health, State of Utah, and these comments
16 were prepared by the staff of the Bureau of Water Quality.

17 The letter is addressed to John A. Green in Denver.
18 Dear Mr. Green:

19 We have reviewed the Draft Environmental Impact
20 Statement and the Summary for the Utah Lake-Jordan River
21 Water Quality Management Planning Study. Our review of
22 this information has raised serious questions as to the real
23 intent and purpose of such a statement, which we always
24 assumed is to assess the detailed environmental impacts of
25 the recommended management plan developed in the original

1 two-year study of the Jordan River Basin.

2 It appears that the document goes far beyond this
3 purpose because a major portion is devoted to a rehash of
4 the alternatives originally considered in the study. This
5 certainly does not seem to be the time nor the method for
6 any objections or criticism of the recommendations of the
7 original study since they should have been voiced and
8 resolved at the time of original submittal. We are bothered
9 also by the additional time and money which has been spent on
10 this endeavor since it has been rechecked in portions of the
11 study at least four times by separate efforts.

12 A re-evaluation of the technical aspects of this
13 plan under the disguise of an EIS is particularly untimely
14 in view of fact that the implementation is already proceeding
15 and the study is being used as a base for ongoing 208 studies.
16 Also from the review of the EIS document, it is obvious that
17 your consultants were unable to spend sufficient time here
18 in Utah to really become as familiar with the local situation
19 as the other consultants who have reviewed the Basin Plan.
20 This is particularly disconcerting since there are numerous
21 misconceptions presented and many ideas which are central
22 to the main issues were not presented in any detail.

23 Our specific comments on the Draft Environmental
24 Impact Statement and Summary are as follows:

25 One area of major importance in the original plan

1 which is hardly mentioned and definitely not evaluated in
2 the EIS is Utah's philosophy of an acceptable health risk
3 when treated domestic wastewater is discharged to an
4 uncontrolled environment.

5 Utah, like many other states including California,
6 and individuals in the field of sanitary engineering recognizes
7 a need for treatment beyond the secondary level as defined
8 by EPA to reduce the health risks associated with discharging
9 domestic wastewater. After much careful consideration and
10 research of both economic and health aspects, the Utah Water
11 Pollution Committee and the Utah State Board of Health adopted
12 a minimum effluent standard to be effective June 30, 1980,
13 of Level III treatment which could consist of adequate
14 secondary treatment including granular media filtration
15 and chlorination. The standard principally required total
16 and fecal coliforms to be reduced to 200 and 20 organisms per
17 100 ml respectively. Also, since chlorination is more
18 effective at low BOD and suspended solids levels, standards
19 for these parameters were set at 10 mg/l. With these
20 processes a significant reduction of virus is also expected.

21 The establishment of acceptable health protection
22 will be one of the most significant impacts of implementing
23 the recommended plan for the Jordan River Basin, yet this
24 factor was hardly addressed in the EIS when evaluating the
25 impacts of various alternatives.

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1 There are several places in the EIS where it is
2 indicated that EPA has determined that secondary treatment,
3 as defined by EPA, is adequate for health protection when
4 water quality standards are not violated. At the present
5 time we have not seen a formal statement of this concept from
6 EPA, and we question whether this is a national policy since
7 we are advised that EPA, Region IX, has been funding similar
8 treatment projects in California based solely upon considera-
9 tion of virus removal and health protection.

10 The above statement also seems contradictory to
11 the original overall goals of the act. Furthermore, the
12 intent of EPA to drop bacterial limitations from effluent
13 standards may disclose a lack of interest in or knowledge of
14 health protection measures which has to be a serious concern
15 to Utah because of our statutory responsibility to protect
16 health.

17 The second item, there appear to be some serious
18 inconsistencies and misconceptions present in Table III-4,
19 Page 77 of the Environmental Impact Statement and Figure 7,
20 Page 13 of the Summary.

21 According to the unit process diagrams shown on
22 the above pages, Level I treatment has been defined as
23 "secondary treatment." However, the expected effluent
24 capability to be achieved by Level I, as shown in the table,
25 clearly does not meet the secondary treatment definition as

1 defined by EPA or the State of Utah.

2 This discredits the estimated costs of "secondary
3 treatment" as compared to Level III treatment since they are
4 based on changing to Level III from something less than
5 secondary.

6 The above-mentioned unit process diagrams are
7 further misleading since they have been drawn to imply a
8 completely separate unit process for nitrification. This
9 is certainly not intended and can be verified by checking
10 the process diagrams in the original Basin Plan, Page 11-14.
11 The nitrification obtained from Level II effluent is merely
12 that which occurs from proper operation of a conventional
13 secondary treatment plant as required by Utah.

14 The above-mentioned tables also show a different
15 expected effluent quality for Level III and Level IV treatment
16 from that presented in the original basin plan. The data
17 presented indicates that the estimated suspended solids
18 achievable for Level III and Level IV are 15 and 10 mg/l
19 respectively instead of 10 and 5 as presented in the original
20 plan. There is no justification given for increasing the
21 anticipated suspended solids levels. Therefore, we do not
22 agree that these numbers should be adjusted upward or feel
23 that the bulk of the data available today would justify such
24 a change.

25 We question the approach, objectivity, and accuracy

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1 of the cost comparisons presented in this EIS as well as
2 whether this task rightly belongs in a document which is to
3 assess the environmental impacts of a previously-selected
4 plan.

5 The costs are generally presented on a per capita
6 basis. It should be clearly pointed out that these amounts
7 will not be the actual amount requested from the local
8 population since they will be greatly reduced by 75 percent
9 funding of the eligible costs.

10 Since no real cost breakdowns were included with
11 the Environmental Impact Statement, we are concerned with the
12 accuracy of these figures and the relative difference between
13 the previously-defined secondary treatment or Level I and
14 Level III treatment.

15 The results of these cost comparisons indicated
16 that the previously-defined secondary treatment costs varied
17 between 35 percent and 55 percent of the Level III costs.

18 A more meaningful cost comparison would be between
19 secondary treatment to meet State and EPA standards Level II
20 and Level III, polished secondary, treatment for the various
21 alternatives developed in the original plan. According to
22 the detailed cost estimates of consultants presently working
23 on these plans, the incremental increase in cost for the
24 entire basin to provide Level III treatment in addition to
25 adequate secondary treatment amounts to only about 20 percent

1 of the total project cost. As an additional check, using
2 the EPA technical report "Cost Effective Wastewater Treatment
3 Systems," the associated Level III costs are equal to
4 approximately 25 percent of the total project cost.

5 It seems readily apparent to us that Level III,
6 polished secondary, is economically achievable in Utah and
7 also an essential step at this time to keep Utah moving
8 toward necessary water pollution control accomplishments
9 not inflated as a result of unreasonable and improper delays.

10 Item No. 4, in the Summary, on Page 12, there is
11 a comparison made between Utah's coliform requirements for
12 stream and effluent standards and EPA's present requirements.
13 It is also indicated that EPA is considering dropping their
14 effluent requirements for coliform in lieu of a disinfection
15 requirement which meets water quality standards.

16 Utah's requirements call for more stringent coliform
17 limitations for sewage effluent and somewhat less strict
18 requirements in the receiving water. These standards take into
19 account the need for greater restriction of coliforms in
20 effluents known to contain large numbers of human pathogens
21 since the health risks associated with this type discharge
22 are more significant than those encountered in a stream
23 environment where the coliforms may have been introduced
24 from cattle and other non-human sources.

25 Item No. 5, on Page 27 of the Summary, it is stated

1 that with I/I reduction future, waste flows in Wasatch County
2 will be less than at present. We question this statement
3 since there appear to be no moves at the present to limit
4 this development. There are many very large developments
5 in the planning stages including Mayflower Mountain and
6 Silverwood development.

7 On Page 28 of the Summary, it is stated that Deer
8 Creek Reservoir is a source of raw water supply for Provo.
9 This is not the case; however, it is a source of supply for
10 Salt Lake City and a potential source for Orem and Provo.

11 Item No. 7, Page 28 of the Summary indicates that
12 construction of new regional plant facilities will require
13 more land for expansion. This is true; however, it should
14 be noted that the additional land required would be less
15 than that needed to upgrade and expand all existing plants
16 in place.

17 No. 8. Regarding alternative No. 2 on Page 42
18 of the Summary concerning implementation of the Jordan River
19 Plan, there are some serious drawbacks which need to be
20 addressed.

21 Requiring municipalities and sanitation districts
22 to upgrade to secondary treatment now, and in a few years
23 upgrade to Level III, is not a cost effective approach to
24 achieving the overall water quality goals. In addition,
25 this would greatly hinder the momentum required to get a

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1 project moving if they can only accomplish half the job now
2 and will be required to take additional steps in the near
3 future.

4 Item No. 9, on Page 247 and 248 in Environmental
5 Impact Statement, the costs of implementing the recommended
6 plan at secondary treatment for Wasatch County have been
7 shown to be zero on the basis of the assumption that
8 infiltration reduction and growth limitations would make it
9 unnecessary to do anything to the existing plants.

10 We disagree with this reasoning since there appears
11 to be tremendous growth potential for Heber Valley and even
12 with a reduction in flow, the Heber treatment plant would
13 require substantial modification to produce a consistently
14 acceptable effluent.

15 Item No. 10, the analysis on Page 133 of the
16 Environmental Impact Statement of the effect of treated
17 effluents on the Great Salt Lake and Farmington Bay is
18 greatly oversimplified and does not accurately portray the
19 complexities of the environmental impact of these effluents
20 on either the fresh water or the saline ecosystems.

21 As an example, we have listed several statements.
22 Statement No. 1 out of the report: "A direct effect of
23 Great Salt Lake's high salinity content is to kill most
24 bacteria hence reducing the potential for oxygen depletion
25 and health hazards." This statement does not take into

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1 account the fact that these effluents present a possible
2 health hazard in the streams and marsh areas before they even
3 get to the lake. Secondly, the above statement does not take
4 into account the fact that because the fresh effluents are
5 considerably less dense than the concentrated brines of the
6 Great Salt Lake, "fresh water lenses" form on the surface
7 of the lake water and can be detected at times great distances
8 out on the surface of the lake. Pathogens in this fresh
9 water are not killed by the lake water until mixing occurs,
10 this gives rise to the possibility of infection to the
11 increasing number of recreational enthusiasts on the lake.

12 A second statement that appears in the report is:

13 "Additionally, there is a limited algal population to
14 assimilate nutrients, thus aesthetic problems associated with
15 algal blooms and subsequent oxygen depletion may be limited."

16 Even though the numbers of species of algae is limited by
17 the high salt content of the lake, the actual biomass or
18 the total amount of decomposable matter in the water can be
19 extremely high. The numbers of the algae Dunaliella alone
20 have been counted in excess of 300 million organisms/liter.

21 The Great Salt Lake is a biologically productive body of
22 water and the potential for aesthetic and health problems
23 must not be underestimated.

24 And a third statement occurring in the report:

25 "Natural wave action in Great Salt Lake has created a sand

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1 barrier which effectively cuts off Farmington Bay from the
2 remainder of the Lake." Our comments concerning this are,
3 the structure which in effect isolated Farmington Bay from
4 the remainder of the Great Salt Lake is the seven mile long
5 causeway out to the northern tip of Antelope Island - not
6 the sand barrier which temporarily in late 1975 formed across
7 the 50 foot opening as a result of wave action. The freshen-
8 ing action in Farmington Bay began with the construction of
9 the causeway and has continued irrespective of the condition
10 of the small opening in the causeway.

11 It is obvious that efforts to protect public health
12 and water quality on the Great Salt Lake must be taken as
13 seriously as on other bodies of water. The lake cannot be
14 considered for use as a waste dump.

15 In summary, we feel that there are many places
16 in this EIS where the data are presented in such a way that
17 only part of the impacts of implementing a given alternative
18 are clearly demonstrated.

19 The above comments represent a general summary of
20 our evaluation of this draft, and it is hoped that these
21 thoughts will be factored into the final report, and it is
22 signed by Lyman J. Olsen.

23 Thank you, sir.

24 MR. SANDERSON: That was a very thoughtful state-
25 ment, I appreciate it.

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1 I might state, as the speaker knows, there has
2 been a great deal of dialogue between the Division of Health
3 of Environmental Quality and EPA regarding the actual effect
4 that the State of Utah Level III requirement will have on the
5 funding sequence of the projects in Utah. EPA has had a
6 concern that because of the Court case in the State of
7 Virginia, that in essence stated that any community that
8 was not at secondary treatment levels by '77 should be taken
9 to Court for enforcement reasons, because the Federal Water
10 Pollution Control Act does state that secondary treatment
11 levels is the national goal by '77, and thus we were
12 concerned that by utilizing construction grants money to
13 go to the Level III level of treatment prior to all
14 communities achieving Level II, if you will, that we would
15 place some communities in jeopardy.

16 After a lot of discussions, I believe the State
17 of Utah and EPA are pretty close on this issue, and that
18 our fears are not going to be materialized because of some
19 minor adjustments.

20 Therefore, I think we have made a lot of progress
21 in this area, and on the public health issue, I am glad that
22 these discrepancies were pointed out in the report, because
23 they are really in error the way they are written, because
24 it is the Federal Act that requires the discharges of all
25 domestic treatment plants to be at secondary treatment levels

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1 by '77 and not EPA. We haven't made any kind of a public
2 health determination in that regard, and certainly concur
3 with the State of Utah that the higher the level, the more
4 margin of safety, and we concur in that. That's why we
5 circulate these drafts. We can't always catch all these
6 errors and over simplifications.

7 I appreciate the amount of work you put into
8 reviewing that draft, sir.

9 Does anyone else wish to make a statement this
10 afternoon?

11 (No response.)

12 MR. SANDERSON: Seeing no one, we will recess
13 until 7:00 p.m. this evening.

14 Thank you for coming.

15 (Whereupon, at 2:52 o'clock p.m., the hearing was
16 recessed until 7:00 o'clock p.m., in the same location.)
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EVENING SESSION

7:04 p.m.

MR. SANDERSON: The hearing will come to order, please.

As was announced earlier, we have reconvened at 7:00 p.m., June 10, 1976, at the Salt Palace to take comments from the public regarding the Draft Environmental Impact Statement for the Utah Lake-Jordan River Water Quality Management Planning Study.

My name is Jim Sanderson. I am the Regional Counsel in Denver, the EPA Region VIII headquarters. With me is Bob Doyle, Environmental Specialist, and Pat Crotty who is a Specialist in Sanitary Engineering.

So far, I have received no indication from anyone that they wish to make a statement. The record will reflect that there are five in attendance in the audience, and does anyone wish to volunteer at this point?

(No response.)

MR. SANDERSON: Seeing no one, I will recess for five minutes to see if there are any latercomers.

(Whereupon, a short recess was taken.)

MR. SANDERSON: The record will reflect that five minutes have passed, and the Hearing Officer has still not received an indication of an interest to present any oral statement.

Therefore, the hearing will adjourn.

(Whereupon, at 7:10 o'clock p.m., the hearing was
adjourned.)

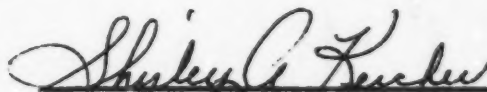
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REPORTER'S CERTIFICATE

This is to certify that the attached proceedings before the Environmental Protection Agency in the matter of: PUBLIC HEARING ON DRAFT ENVIRONMENTAL IMPACT STATEMENT FOR UTAH LAKE-JORDAN RIVER WATER QUALITY MANAGEMENT PLANNING STUDY, at Salt Lake City, Utah, Thursday, June 10, 1976, was held as herein appears, and that this is the original transcript thereof.

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Shirley A. Kercher
Official Reporter
FEDERAL REPORTING SERVICE
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GLOSSARY OF ABBREVIATIONS

. BOD	-	Biochemical Oxygen Demand
. CO	-	Carbon Monoxide
. mg/l	-	milligrams per liter
. MPN/100 ml	-	Most probable number of organisms per 100 milliliters
. NO ₃	-	Nitrates
. ppm	-	parts per million
. PO ₄	-	Phosphates
. SIP	-	Utah State Implementation Plan for attainment of national ambient air quality standards.
. TDS	-	Total Dissolved Solids
. TN	-	Total Nitrogen
. TSP	-	Total Suspended Particulates
. TSS	-	Total Suspended Solids
. ug/m ³	-	micrograms per cubic meter

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Personal Communications:

Mr. Ken Alkema, EPA, Denver, Enforcement Division.
Ms. Lois Arnow, University of Utah Herbarium.
Ms. Genevieve Atwood, Project Geologist, Ford, Bacon and Davis Utah,
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Mr. Paul Blacker, Biologist, Utah Department of Social Services,
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Mr. James O. Brooks, Civil Engineer, EPA, Denver, Office of Grants.
Mr. Max Dodson, Environmental Planner, EPA, Denver, Planning Coordination
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Mr. Robert Doyle, Project Director, EPA, Denver, Environmental Impact
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Mr. Rudy Drobnick, Utah Division of Wildlife Resources.
Mr. Clyde Hopkins, Water Quality Specialist, Utah Department of Social
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Mr. Jim Kimble, Wildlife Biologist, U. S. Forest Service, Wasatch Forest.
Mr. Ray Lundquist, U. S. Forest Service, Wasatch National Forest.
Mr. David Madsen, Utah State Archaeologist.
Mr. Emil Meyer, Superintendent, Salt Lake City Suburban Sanitary District
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Mr. Jay Pitkin, Planning Coordinator, Utah Department of Social Services,
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Mr. Don Proctor, United States Forest Service, Wasatch National Forest.
Mr. Melvin Smith, Utah State Historical Society.
Mr. William Tabor, EPA, Denver, Data Information Section (STORET).